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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Document Control Desk

SUBJECT: **R.E. Ginna Nuclear Power Plant**
Renewed Facility Operating License No. DPR-18
Docket No. 50-244

Ginna Station Snubber Program Plan

Per ASME OM Code Subsection ISTA-3200(a), R.E. Ginna Nuclear Power Plant (Ginna) is submitting the Inservice Test (IST) examination and testing plan for snubbers. The attachment is the Ginna Station Snubber Program Plan.

Should you have any questions regarding this submittal, please contact Thomas Harding at 585-771-5219.

Sincerely,

Thomas G. Mogren
Manager - Nuclear Engineering Services

TM/KC
Attachment: Ginna Station Snubber Program Plan

cc: NRC Regional Administrator, Region I
NRC Project Manager, Ginna
NRC Resident Inspector, Ginna

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NRR

LO-PLNRC-1002782

Attachment

Ginna Station Snubber Program Plan

Snubber Program Plan

PROGPLAN

Ginna Station

SNUB-PROGPLAN

Revision 0

September 20, 2013

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Program Owner — Date

Reviewed by: Walter Tono — 9/20/13
Independent Reviewer — Date

Approved by: Erik Durkish — 09-20-2013
Supervisor — Date

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REVISION STATUS SHEET

Revision Number	Affected Sections	Description of Revision
0	All	Initial Issue

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1.0 INTRODUCTION

1.1 Purpose

A. The Snubber Program Plan establishes the requirements for the implementation of the R. E. Ginna Nuclear Power Plant Snubber Program.

B. The Snubber Program is required to ensure the Operational Readiness of all safety related and Seismic Category I mechanical, hydraulic and component dynamic restraints (snubbers).

C. The Snubber Program Plan establishes the necessary technical and administrative requirements for the performance and evaluation of examination and operational readiness testing results, including requirements for scope expansion and corrective actions.

D. The Snubber Program Plan provides direction for activities related to the development, preparation, maintenance, revision, implementation and control of Snubber Program inspection plans and schedules.

1.2 Background

This section summarizes significant events, publications and program changes to illustrate the development of the program.

Ginna Station snubber visual examination and functional testing requirements were originally defined within the Technical Specifications. All of the program requirements were captured within the licensing basis of the plant.

IE Bulletin 81-01, "Surveillance of Mechanical Snubbers", was published by the NRC due to several instances of failures of mechanical snubbers had been experienced. Pacific Scientific snubbers, as well as mechanical snubbers from another supplier (not installed at Ginna), were included. The attributed causes (for Pacific Scientific snubbers) included excessive loading and improper installation. The required action for the licensee in response to the bulletin was the creation of a snubber inspection and testing program. This included an initial inspection and testing scope of all installed, safety related snubbers, a schedule for an inspection program, and a full report of the results to the NRC.

In Generic Letter 90-09, "Alternative Requirements for Snubber Visual Inspection Intervals and Corrective Actions", the NRC revised the visual inspection requirements for nuclear power plants to be proportional to the applicable snubber population size, to eliminate excessive and unnecessary radiological exposure and cost, and the visual inspection interval may be extended as long as two fuel cycles (up to 48 months).

Ginna Station converted to the Improved Technical Specifications (ITS, Amendment No. 61) in 1996, which completely removed snubber inspection and testing requirements from the Tech Specs and into the procedure, IP-IIT-5. This resulted in the loss of the LCO which previously allowed removal of snubbers for a period of time, without declaring the system as inoperable.

In 2007, Ginna amended the operating license to add Limiting Condition of Operation LCO 3.0.8 (Amendment No. 104), which restored the ability to perform maintenance and testing of snubbers without declaring the associated system inoperable.

In 2009, the Ginna Snubber Program implemented ASME OM Code Subsection ISTD, "Preservice and Inservice Examination and Testing of Dynamic Restraints (Snubbers) in Light-Water Reactor Nuclear Power Plants". The incorporation of ISTD "Codified" the snubber program. In addition to visual examinations and testing, ISTD requires the application of service life monitoring, making the program more proactive for predicting and preventing snubber failures. This also permitted Ginna the option to incorporate Code Case OMN-13 to extend the visual examination interval out to a maximum of 10 years.

In 2013, this program plan was created to establish the Ginna Station Snubber Program specific technical information out of the IP-IIT-5 procedure, such as program scoping, acceptance criteria and testing plans.

1.3 Scope/Applicability

A. This Program Plan is applicable to the R. E. Ginna Nuclear Power Plant.

B. The Snubber Program applies to all safety related and Seismic Category I snubbers.

C. This Program Plan is written to ensure compliance with the requirements established by ASME OM Code, Subsection ISTD, 2004, for the following activities:

1. Visual Examination
2. Functional Testing
3. Service Life Monitoring

D. The boundaries of this program include the snubber assembly from pin to pin inclusively. Additional guidance is provided within this Program Plan regarding the optional expansion of these boundaries to complete surveillance requirements for the Inservice Inspection (ISI) Program to coordinate efforts.

E. The guidance for visual examination, testing and service life monitoring, may be applied for non-safety related snubbers outside the scope of the program. However, snubbers outside the scope of the program are not required to comply with the commitments of this program, therefore, extent of condition and corrective actions shall be evaluated on a case by case basis.

1.4 Quality Assurance Requirements

Activities conducted under the scope of this program shall be controlled by the Ginna Station Quality Assurance Program and/or a quality assurance program which meets the requirements of Reference 2.1.I.

2.0 REFERENCES

2.1 Developmental References

A. 10 CFR 50.55a, Codes and Standards

B. ASME, Boiler and Pressure Vessel Code, 2004 Edition, Section XI

C. ASME OM Code, 2004 Edition, Subsection ISTD, Preservice and Inservice Examination and Testing of Dynamic Restraints (Snubbers) in Light-Water Reactor Power Plants

D. ASME OM Code Case OMN-13, Revision 0

E. NRC-IE Bulletin 81-01, Surveillance of Mechanical Snubbers

F. NRC Generic Letter 90-09, Alternative Requirements for Snubber Visual Inspection Intervals and Corrective Actions

G. CNG-AM-3.01, Fleet Program Directive, Snubber Program

H. IP-IIT-1, ASME Section XI Repair and Replacement Process for Class 1, 2 and 3

I. ANSI/ASME NQA-1, Quality Assurance Requirements for Nuclear Facility Applications

J. ME-88-0001, Design Analysis, Ginna Station Hydraulic Snubber Seal Life

K. IP-IIT-5, Snubber Inspection and Testing Program

L. Regulatory Guide 1.192, Operation and Maintenance Code Case Acceptability ASME OM CODE.

M. DR 3020, Basic-PSA Design Report, Mechanical Shock Arrestors Service Life Extension Program & Preventative Maintenance Recommendations, Revision No. 4, 6/2/11.

2.2 Performance References

A. CNG-AM-1.01-1000, Equipment Reliability Process

B. CNG-PR-3.01-1000, Records Management

C. CNG-OP-4.01-1000, Integrated Risk Management

D. CNG-CA-1.01-1000, Corrective Action Program

E. CNG-AM-1.01-1006, Qualification and Certification of Nondestructive Examination Personnel, Procedures and Equipment

F. CNG-CM-1.01-1003, Design Engineering and Configuration Control

G. CNG-PR-1.01-1007, Control of Vendor Procedures

H. CNG-PR-1.01-1009 Procedure and Work Order Use and Adherence Requirements

I. M-40.1, Hydraulic Snubber Removal and Reinstallation

J. M-40.2, Inspection and Maintenance of Hydraulic Snubbers (Bergen-Paterson)

K. M-40.5, Inspection and Maintenance of Hydraulic Snubbers (ITT Grinnell)

L. M-40.7, Steam Generator Snubber Inspection and Maintenance

M. M-40.8, Functional Testing of Hydraulic Snubbers

N. M-40.9, Functional Testing of Anker-Holth Hydraulic Snubbers

O. M-40.11, Functional Testing of Mechanical Snubbers using a Pacific Scientific Validator

P. M-40.12, Functional Testing of Mechanical Snubbers

Q. M-40.13, Mechanical Snubber Removal and Reinstallation Procedure

R. M-37.168, Testing/Adjusting NUPRO - "CPA" & "R3A" Relief Valves for Snubber Validators

S. EP-VT-106, Visual Examination of Component Supports

T. EP-VT-107, Visual Examination for the Ginna Station Snubber Inspection and Test Program

U. Technical Specification, LCO 3.0.8, "Inoperability of Snubbers"

V. TSTF-IG-05-03, "Implementation Guidance for TSTF-372, Revision 4, 'Addition of LCO 3.0.8, Inoperability of Snubbers'", dated October 2005

W. Application for Technical Specification Change to Add LCO 3.0.8 on the Inoperability of Snubbers Using the Consolidated Line Item improvement Process, dated March 19, 2008

X. Letter from Enertech (Ira J. Silverman, PE) discussing service intervals and frequency of visual inspections for quick disconnect leakage

Y. UFSAR, Section 3.9.3.3.5

Z. A-1101, Performance of Tests

AA. A-1102, Qualification and Certification of Test Personnel

BB. ESR-13-0257, Add Two Snubbers Identified in CR-2013-002267 to the Scope of the Ginna Station Snubber Program

CC. Lake Engineering Company Report, LEC-945-R1, Rev. 0, Degradation Analysis of Snubber Serial No. 7051

DD. Lake Engineering Company Report, LEC-1311-R1, Rev. 0, Seal Life Evaluation of Bergen-Paterson Snubbers at Ginna Power Station

EE. CR-2013-000767, Snubber FWU-44 Exceeded the Recommended Seal Life

FF. CR-2013-002060, Trend in Snubber Failures During the 2012 RFO

3.0 DEFINITIONS

3.1 Activation

The change of condition from passive to active, in which the snubber resists rapid displacement of the attached pipe or component.

3.2 Application-Induced Failures

Failures resulting from environmental conditions or application of the snubber for which it has not been designed or qualified.

3.3 Defined Test Plan Group (DTPG)

A population of snubbers from which samples are selected for testing.

3.4 Design or Manufacturing Failure

Failures resulting from a potential defect in manufacturing or design that give cause to suspect other similar snubbers. This includes failures of any snubber that fails to withstand the environment or application for which it was designed.

3.5 Diagnostic Testing

Testing to determine the cause or mechanism associated with failure, degradation, or performance anomaly of a snubber.

3.6 Drag Force

The force that will sustain low-velocity snubber movement without activation throughout the working range of the snubber stroke.

3.7 Equipment Dynamic Restraint (Snubber)

A device that provides restraint to a component or piping system during the sudden application of forces, but allows essentially free motion during thermal movement.

3.8 Examination

The observing, visual monitoring, or measuring to determine conformance to Owner-specified requirements.

3.9 Exercising

Demonstration that the moving parts of a component function.

3.10 Failure Mode Group (FMG)

A group of snubbers that have failed and those other snubbers that have similar potential for similar failure.

3.11 Hydraulic Snubber

A dynamic restraint device in which load is transmitted through a hydraulic fluid.

3.12 Inaccessible Snubber

A snubbers that is in a high radiation area or other conditions that would render it impractical for the snubber to be examined under normal plant operating conditions without exposing plant personnel to undue hazards.

3.13 Inservice Test

A test to assess the operational readiness of a system, structure, or component after first electrical generation by nuclear heat.

3.14 Maintenance

The replacement of parts, adjustments, and similar actions that do not change the design (configuration and material) of an item.

3.15 Maintenance, Repair, and Installation-Induced Failures

Failures that result from damage during maintenance, repair, or installation activities, the nature of which causes other snubbers to be suspect.

3.16 Mechanical Snubber

A dynamic restraint device in which load is transmitted entirely through mechanical components.

3.17 Modification

An alteration in the design of a system, structure, or component.

3.18 Monitoring

Continuous or periodic observation or measurement to ascertain the performance or obtain characteristics of a system, structure, or component.

3.19 Nonintrusive Testing

Testing performed on a component without disassembly or disturbing the boundary of the component.

3.20 Normal Operating Conditions

Operating conditions during reactor startup, operating at power, hot standby, reactor cooldown, and cold shutdown.

3.21 Operating Temperature

The temperature of the environment surrounding a snubber at its installed plant location during the phase of plant operation for which the snubber is required.

3.22 Operational Readiness

The ability of a component to perform its specified functions.

3.23 Operational Readiness Testing

Measurement of the parameters that verify snubber operational readiness.

3.24 Owner

An organization owning or operating a facility where items are installed or used.

3.25 Performance Testing

A test to determine whether a system or component meets specified acceptance criteria.

3.26 Plant Operation

The conditions of startup, operation at power, hot standby, and reactor cooldown, as defined by plant technical specifications.

3.27 Preservice Test

A test performed after completion of construction activities related to the component and before first electrical generation by nuclear heat, or in an operating plant, before the component is initially placed in service.

3.28 Preservice Test Period

The period of time following completion of construction activities related to the component and before first electrical generation by nuclear heat, in which component and system testing takes place, or in an operating plant prior to the component being initially placed in service.

3.29 Qualitative Testing

Testing performed to establish parameters without determining the specific measure of the parameter.

3.30 Quantitative Testing

Testing performed to establish the specific measure or limit of a parameter, such as that required to establish that a parameter is within a specified range.

3.31 Reference Point

A point of operation at which reference values are established and inservice test parameters are measured for comparison with applicable acceptance criteria.

3.32 Reference Values

One or more values of parameters as measured or determined when the equipment is known to be operating acceptably.

3.33 Release Rate

The rate of the axial snubber movement under a specified load after activation of the snubber takes place.

3.34 Repair

The process of restoring a degraded item to its original design requirements.

3.35 Replacement Snubber

Any snubber other than the snubber immediately previously installed at a given location.

3.36 Routine Servicing

The performance of planned, preventive maintenance.

3.37 Service Life

The period of time an item is expected to meet the operational readiness requirements without maintenance.

3.38 Service Life Population

Those snubbers for which the same service life has been established.

3.39 Stroking

To exercise the snubber in the tension and compression directions by hand or using a tool, to ensure operational readiness. Stroking may also be used as preventative maintenance for mechanical snubbers to redistribute the grease amongst the moving parts.

3.40 Swing Clearance

The movement envelope within which the snubber must operate without restriction, from the cold installed position to the hot operating position.

3.41 Test Temperature

The temperature of the environment surrounding the snubber at the time of the test.

3.42 Transient Dynamic Event Failure

The inability of a snubber to perform its intended function due to an unanticipated transient dynamic event.

3.43 Trending

A comparison of current data to previous data obtained under similar conditions for the same equipment.

3.44 Unacceptable Snubber

A snubber that does not meet examination or testing requirements.

3.45 Unexplained Failure

A failure for which the cause has not been determined.

4.0 RESPONSIBILITIES

4.1 Snubber Program Owner Responsibilities, in addition to those listed in IP-IIT-5:

A. Support field implementation of Snubber Program testing and examination activities.

B. Provide Snubber Program scope for online and Refueling Outage (RFO) activities to Integrated Work Management (IWM) and ensure WOs generated reflect appropriate scope.

C. Review Snubber Program Work Orders (WO).

D. Review Snubber Program activity schedules.

E. Coordinate spare Snubbers and spare parts to ensure that adequate stock levels are maintained and those stocked are in acceptable condition, including snubber fluid (hydraulic snubbers) or grease (mechanical snubbers), in preparation for maintenance and testing.

F. Coordinate resources for Snubber Program activities including site Maintenance resources, vendor Maintenance resources and others as necessary. For vendor resources, ensure budget is sufficient and Purchase Orders (PO) are in place.

G. Ensure vendor procedures are accepted for use per CNG-PR-1.01-1007 in a timely manner, to support Snubber Program activities.

H. Maintain and periodically review Snubber Program Preventative Maintenance (PM), documents and procedures.

4.2 Snubber Program Maintenance Supervisor

A. Review all Snubber Program documents and Work Orders (including any procedures used to implement WOs).

B. Review Snubber Program schedule.

C. Perform walk downs prior to implementation.

D. Communicate with interfacing Departments, such as Operations, Maintenance Support, RP, Fire Protection, Security and Safety, to coordinate efforts as necessary and ensure pre-work approvals are obtained and WO signed.

E. Ensure pre-job brief is conducted for all individuals involved with Snubber Program WOs prior to starting field activities.

F. Ensure WOs and procedures are maintained up to date in accordance with CNG-PR-1.01-1009.

G. Obtain necessary items, such as spare snubbers, fluid, grease, protective bellows (for snubbers installed outside in the Façade area) and consumables, from the stockroom.

H. Ensure all QA paperwork and tags for safety related parts and components are retained and either returned to stock with the part or logged in the WO for parts which are installed.

I. Acquire tools necessary for each WO from tool crib or CSB.

J. Oversee all Snubber Program field activities including examinations, testing, removal/installation and rebuilding.

K. Initiate a Condition Report (CR) **OR** notify Snubber Program Owner to initiate a CR for any conditions adverse to quality, including but not limited to examination and test failures, job site interferences, unsafe or unexpected conditions.

L. Return all acceptable (ready for installation) parts back to stock. Ensure any unacceptable parts are labeled with deficiencies specifically noted.

M. Ensure WOs and procedures are completed, signed by all necessary individuals and submitted to records.

N. Verify equipment and tools are available (inside and outside the RCA) for Snubber Program activies, including but not limited to the following:

1. Test equipment (test benchs, validators, etc.)

2. Removal/Installation tools inside Containment (hammers, brass drifts, vice grips, etc.)

3. Specialized tools for PSA snubbers to support re-greasing or rebuilding.

5.0 PROCESS

5.1 General Requirements for Examination and Testing

A. Instrumentation and Test Equipment

1. All standard calibrated Measuring and Testing Equipment (M&TE), such as thermometers, light meters, torque wrenches, etc., shall be obtained from or approved by the Ginna M&TE Coordinator.

2. For use of snubber testing equipment provided by the vendor, all applicable calibration records and operating procedures shall be required for acceptance by the PO.

3. Approval of the vendor operating procedure for applicable vendor testing equipment is considered approval of the use of vendor testing equipment.

B. Visual Examination Requirements

1. The examination boundaries shall include the snubber assembly from pin to pin, inclusive.

   a. When the examination will be credited by the ISI program, the entire support must be included, the boundaries are from the attachment to the structure to the attachement to the pipe/component, inclusive of all applicable snubbers considered to be part of that support assembly.

2. Recommended Snubber Examination Considerations

   a. Inadequate reservoir fluid level.

   b. Loose, missing, or incorrectly installed structural connections or fasteners.

      (1) Missing cotter pins, locknuts, washers, spacers and/or loose fasteners or locknuts not fully engaged may not result in the unacceptability of the snubber.

      (2) The snubber is considered unacceptablable if there is a lack of full engagement of the snubber load pins between the snubber paddle and the support bracket.

   c. Vented reservoir oriented such that hydraulic fluid cannot gravitate to snubber.

d. Corrosion or solid deposits that could result in unacceptable snubber performance.

e. Deformed structural attachment or piston rod.

f. Weld arc strikes, paint, weld slag, adhesive, or other deposits on piston rod or support cylinder that could result in unacceptable snubber performance.

g. Spherical bearing not fully engaged in attachment lug.

h. Inadequate position setting.

(1) Deviations from the table settings or drawing configuration may not result in snubber unacceptability.

(2) If the as-found setting of the snubber is less than 1/2" from the fully extended or the fully retracted position, the snubber shall be considered unacceptable.

3. Types of Examinations

a. Pre-service Examinations

(1) Ginna Station has been in operation since 1969. EWR2512, Ginna Station Seismic Upgrade Program, was established in 1979. Since then many snubber visual inspections had been performed prior to implementing the ASME OM Code Subsection ISTD. During the 2006 RFO, 100% of the snubber program population was visually examined in preparation for implementation of Subsection ISTD.

(2) For new systems or systems modified in such a manner that thermal movements of piping is expected to change, preservice examinations shall be performed in accordance with ISTD-4100.

(3) Prior to declaration of the snubber as operationally ready, snubbers shall be visually inspected pre-service after the initial installation or after the snubber was removed for replacement, modification, maintenance or testing.

(4) Examinations shall be performed in accordance with approved and current Ginna Station visual inspection procedures [2.2.S & 2.2.T].

(5) Snubbers that are installed incorrectly or otherwise fail to meet the visual examination acceptance criteria shall be installed correctly, adjusted, repaired, or replaced. The installation-corrected, adjusted, repaired, or replacement snubber shall be examined in accordance with, and shall meet the requirements of this section. Also, replacement snubbers shall meet the requirements for Preservice testing per Section 5.1.D of this document.

b. In-service Examination

(1) Inservice examination shall be a visual examination to identify physical damage, leakage, corrosion, or degradation that may have been caused by environmental exposure or operating conditions. External characteristics that may indicate operational readiness of the snubber shall be examined. An approved examination procedure and acceptance criteria shall be used [2.2.S & 2.2.T].

(2) All of the snubbers shall be categorized as one population for examination or they may be categorized as accessible and inaccessible populations.

(3) The entire Ginna station snubber program population is typically considered as one for purposes of Inservice Examinations.

(4) The decision to categorize the snubbers as one population or as separate populations may be made during or after the examination.

(5) If combining accessible and inaccessible populations into one population, the shorter interval shall be used for subsequent examination.

(6) A snubber that requires further evaluation or is classified as unacceptable during inservice examination may be tested in accordance with the requirements of Section 5.1.E of this document.

(7) Results that satisfy the operational readiness test criteria of Section 5.1.E shall be used to accept the snubber, provided the test demonstrates that the unacceptable condition did not affect operational readiness.

c. Inservice Examinations Intervals

(1) Inservice examination intervals shall begin at the end of the previous examination interval, and conclude at the end of the next refueling outage.

(2) The duration of examination intervals following the completion of the second refueling outage shall be in accordance with Attachment 3.

(3) Snubbers determined to be unacceptable based on the visual examination acceptance criteria at any time during the interval shall be counted in determining the subsequent examination interval in accordance with Attachment 3.

(4) Code Case OMN-13, Requirement for Extending Snubber Inservice Visual Examination Interval at LWR Power Plants, may be used to allow extension of the visual examination interval beyond the maximum interval allowed in Attachment 3 and up to as long as 10 years, when the additional requirements specified within the Code Case are met.

C. Operational Readiness Testing General Requirements

1. Testing Loads

Snubbers shall be tested at a load sufficient to verify the test parameters, testing at less than rated load must be correlated to test parameters at rated load. Ginna defines sufficient test loading within Attachment 5.

2. Correction Factors

Reference 2.1.C recognizes that there may be differences between the installed operating conditions and the conditions under which a snubber is tested. In such cases, correction factors shall be established and test results shall be correlated to operating conditions, as appropriate.

3. Test Parameters and Methods

Guidelines for establishing snubber functional test methods are given in this Division's Nonmandatory Appendix H, Test Parameters and Methods. See Attachment 5 of this document for specific test criteria.

a. Test Variables

Snubber functional testing involves three test variables. These variables are force, displacement, and time. All snubber test parameters are measured in terms of one or more of these variables. For example, velocity is measured as change in displacement per unit time and acceleration is measured as change in velocity per unit time. Snubber functional tests involve measuring at least one of these variables as a dependent variable, while controlling at least one of the other variables.

b. Measured Test Parameters

Subsection ISTD requires measurement of one or more of the following parameters:

(1) Drag force

Drag force is measured by controlling the snubber stroke displacement while measuring the resulting resistance force for an inactivated snubber. Generally, the rate of change in displacement (velocity) is also controlled. Drag force testing is required for mechanical snubbers. Additionally, drag force testing may be used for hydraulic snubbers to verify the proper assembly.

(2) Activation

Activation applies to snubbers that have two distinct operating modes (i.e., activated and inactivated). Activation may involve control valve closure for a hydraulic snubber or engagement of a braking mechanism for a mechanical snubber. The three activation parameters are as follows:

(a) Locking velocity is used for hydraulic snubbers and is measured by stroking the snubber at a gradually increasing velocity. Generally, the rate of change in velocity (ramp rate) is also controlled. Locking velocity is determined by recording stroke velocity at the point of control valve closure. Control valve closure may be identified using a number of indicators including the point of sudden force increase or velocity decrease.

(b) Velocity threshold is used for hydraulic snubbers and is measured by stroking the snubber at a velocity sufficient to activate the velocity limiting mechanism. After activation, a specified constant force is applied. Velocity threshold is determined by recording the average stroke velocity over a specified time period or stroke distance, after the force stabilizes at the specified value. This applies to a velocity-limiting device.

(c) Acceleration threshold is used for mechanical snubbers and is measured by stroking at an acceleration sufficient to activate the acceleration limiting mechanism. After activation, a specified force is applied. Acceleration threshold is determined by recording the average acceleration over a specified time period or stroke distance, after the force stabilizes at the specified value. This applies to an acceleration-limiting device.

(3) Release Rate (Bleed Rate)

Release rate is used for hydraulic snubbers and is measured by applying a specified constant force to an activated snubber while measuring the resulting stroke velocity. Release rate is determined by recording the average stroke velocity over a specified time period or stroke distance, after the force stabilizes at the specified value.

c. Variation of Testing Parameters

Snubber functional testing may involve the use of more than one test machine. Test results are subject to some variation due to a number of influences, including differences in instrumentation, the magnitude of controlled variables, variations in test machine control methods, environmental influences, and variations in data interpretations.

(1) Drag Test Velocity

For some snubber models, drag force is sensitive to test velocity. Test velocity should therefore be representative of the anticipated thermal movement rate of the components to which the snubbers are attached. Establishing standard drag test velocities will also facilitate identification of trends.

For acceleration-limiting snubbers, the ramp rate (acceleration) to the desired drag test velocity should be maintained at a level that is less than anticipated activation threshold.

(2) Test Force

(a) Effect on Release Rate

The relationship between release rate and test force is generally consistent and predictable. Release rates measured at any test force can generally be reliably converted to the associated release rate value at the specified test force using empirically derived correlation curves or equations. For example, the release rate of a snubber tested at 60% of rated load may be converted to the corresponding release rate at 100% of rated load.

(b) Effect on Activation

Locking velocity is unaffected by test force because the test force is not applied until after activation.

Velocity threshold and acceleration threshold are measured while applying a force to the snubber. For these parameters, the effect of variations in test force should be established for each snubber model, for either correlation purposes, or for verification that the parameter is unaffected by such variations.

(c) Velocity Ramp Rate

Locking velocity test results may be affected by velocity ramp rate (the rate of increase of stroke velocity). Results of locking velocity tests conducted at a ramp rate less than 2 in./min/sec will generally be unaffected in this regard.

4. Data Recording

To the extent practical, continuous recording of test variables should be performed. This data will assist in verification of the test results and resolution of any snubber performance anomalies.

5. Verification of Test Results

Engineering shall review all test results. Any failed testing or potentially degraded parameters shall be evaluated.

6. Snubbers shall be tested before and after any maintenance, repair, modification or replacement.

7. Testing may be used to verify the operational readiness of snubbers following a transient dynamic event.

8. Test Failure Corrective Actions

Unacceptable snubbers shall be adjusted, repaired, modified or replaced to restore the system design with a verified operationally ready snubber. A CR shall be initiated in accordance with CNG-CA-1.01-1000 for all unsatisfactory or degraded test results.

For unsatisfactory inservice tests the following requirements apply:

a. System, Structure or Component Evaluation

An evaluation shall be performed of the system(s) or components of which an unacceptable snubber is a part, for possible damage to the supported system or component. If the evaluation determines that stress levels exceeded allowable levels, corrective actions, such as inspections or repairs, shall be determined as appropriate.

b. Scope Expansion

Additional test samples shall be at least one-half the size of the initial sample from that DTPG and comply with Section 5.1.E.7.

c. Deletion of Unacceptable Snubbers

Snubbers may be deleted from the plant based on analysis of the affected piping system. When an unacceptable snubber is deleted, the deleted snubber shall nevertheless be considered in its respective examination population, examination category, or failure mode group (FMG) for determination of corrective actions.

D. Preservice Operational Readiness Testing

Preservice operational readiness testing shall be performed on all snubbers prior to installation in the plant. Testing may be performed at the manufacturer's facility.

1. Snubbers that fail the preservice operational readiness test shall be evaluated for the cause(s) of failure(s).

2. If a design deficiency in a snubber is found, it shall be corrected by changing the design or specification, or by other appropriate means.

3. Other deficiencies shall be resolved by adjustment, modification, repair, replacement, or other appropriate means.

4. Adjusted, modified, repaired, or replacement snubbers shall be tested to verify that the maintenance was adequately performed and the snubber is operationally ready.

E. Inservice Operational Readiness Testing

1. Test Parameters and Methods

a. Snubbers shall be tested for operational readiness during each fuel cycle in accordance with the 10% Sample Plan. For each snubber determined to be unacceptable by operational readiness testing, additional snubbers shall be tested in accordance with Section 5.1.E Subsections 4-7.

b. Ginna Station snubber testing criteria is specified within Attachment 5.

c. Snubbers shall be tested in their as-found condition regarding the parameters to be tested to the fullest extent practicable. Test methods shall not alter the condition of a snubber to the extent that the results do not represent the as-found snubber condition.

d. Snubbers may be tested in their installed location. The methods used to perform in-place testing shall be subject to acceptance by the Snubber Program Owner prior to performance of the testing.

e. Snubbers may be removed and bench tested. The methods used for bench testing the snubbers shall be performed in accordance with approved Ginna Station procedures or a vendor method which is subject to acceptance by the Snubber Program Owner prior to performance of the testing. For example, if a vendor is performing the test using the vendor test equipment, the vendor's testing process shall be reviewed and accepted by the Snubber Program Owner. After reinstallation, the snubbers shall meet the requirements for Section 5.1.D.

f. When snubber size, test equipment limitations, or inaccessibility prevents use of methods for testing the entire snubber assembly, snubber subcomponents that control the parameters to be verified shall be examined and tested. The methods used to perform in-place testing shall be subject to acceptance by the Snubber Program Owner prior to performance of the testing.

g. When test methods are used that either measure parameters indirectly, or measure parameters other than those specified, the results shall be correlated with specified parameters through established methods.

h. Each snubber in a parallel or multiple installation shall be identified and counted individually for the Snubber Program.

i. Fractional sample sizes shall be rounded up to the next integer.

j. Qualitative tests may be used instead of quantitative measurements to verify the testing parameters, if adequate justification is presented and is approved by the NRC. The Owner shall obtain sufficient data, based upon service history or life cycle testing, to demonstrate the ability of the parameter in question to conform to the specification over the life of the snubber (e.g., that activation takes place — without measuring the activation level). A test report that confirms the parameter was within specifications shall be available for each snubber exempted from an inservice quantitative test requirement.

k. Tests of snubbers from the facility shall be performed every fuel cycle. Snubber testing may begin no earlier than 60 days before a scheduled refueling outage.

l. Snubbers may be tested with or without the installed extension pieces.

2. Defined Test Plant Groups (DTPG)

a. The DTPGs shall include all snubbers in the scope of the snubber program. Snubber replacements and snubbers repaired or adjusted as a result of not meeting the preservice examination acceptance requirements shall be exempt for the concurrent test interval.

b. Except as required by Section 5.1.E.2.c, the total snubber population may be considered one DTPG, or alternatively, differences in design, application, size, or type may be considered in establishing DTPGs. The Ginna Station Snubber Program DTPGs are identified in Attachment 4, Table 4.2.

c. Snubbers attached to the steam generator shall be at least one, separate DTPG.

3. The 10% Sample Plan

a. The RFO test plans for the Ginna Station Snubber Program are identified within this program plan document and shall satisfy the equations specified in Section 5.1.E.7.b.

b. The test plan selected for a DTPG shall be used throughout the refueling outage tests for that DTPG and any failure mode group (FMG) that is derived from it.

c. Initial Sample Size and Composition

The initial sample shall contain a 10% sample from each DTPG. Fractional sample sizes shall be rounded up to the next integer. As practicable, the sample shall include representation of the different systems and operating conditions from within the DTPG. The sample may be selected from snubbers concurrently scheduled for seal replacement or other similar service life monitoring activity.

4. Additional Sample Size and Composition

a. When additional samples are required they shall be at least one-half the size of the initial sample from that DTPG and shall satisfy the equations specified in Section 5.1.E.7.b.

b. When an unacceptable snubber has not been assigned to an FMG, the additional sample required by para. ISTD-5320 shall be taken from the DTPG. As practicable, the additional sample shall include the following:

(1) snubbers of the same manufacturer's design

(2) snubbers immediately adjacent to those found unacceptable

(3) snubbers from the same piping system

(4) snubbers from other piping systems that have similar operating conditions such as temperature, humidity, vibration, and radiation

(5) snubbers that are previously untested

c. When samples from an FMG are required, they shall be selected randomly from untested snubbers in the FMG.

5. Test Failures, Failure Mode Groups (FMG) and Corrective Actions (CA)

a. Snubbers that failed the operational readiness inservice test shall be evaluated to determine the cause of the failure. Attachment 6 shall be completed and attached to CR.

(1) The evaluation shall include review of information related to other unacceptable snubbers found during testing that refueling outage.

(2) The evaluation results should be used, if applicable, to determine FMGs to which snubbers may be assigned. Evaluation information may be used to assign previously unexplained unacceptable snubbers to an appropriate FMG.

b. Snubbers found unacceptable according to operational readiness test requirements may be assigned to FMGs. FMGs shall include all unacceptable snubbers with the same failure mode and all other snubbers with similar potential for similar failure. The following FMGs should be considered:

(1) Design or Manufacturing

(2) Application Induced

(3) Maintenance, Repair or Installation

(4) Transient Dynamic Event

(5) Unexplained

When an applicable FMG has not been established, the number of unacceptable snubbers shall determine the additional testing samples

(6) Isolated

Additional tests are not required for an isolated failure. Proper justification is required for declaration of a failure as isolated.

6. Development of Failure Mode Groups (FMG)

a. When one of the following actions are completed, no additional testing is required for the applicable FMGs.

(1) All snubbers in these FMGs are replaced or repaired, or;

(2) The unacceptable snubbers in an application induced FMG shall be replaced or repaired to an acceptable condition, and the environment or applications shall be made compatible with the design parameters for all snubbers in this FMG.

b. When the corrective actions of Section 5.1.E.6.a are not applicable, or are not taken, the following apply:

(1) Tests in the FMG shall be based both on the number of unacceptable snubbers found in the DTPG and determined by the evaluation of test failures to be appropriate for establishing the FMG, and on the number of unacceptable snubbers subsequently found in the FMG.

(2) Testing shall continue until the mathematical expression defined in Section 5.1.E.7 is satisfied or all snubbers in the FMG have been tested.

c. Although additional tests are not required for transient dynamic event FMG failures, the operational readiness of all snubbers in this FMG shall be evaluated by stroking or testing. All operationally ready snubbers in this FMG remain eligible for selection and tests for other appropriate FMGs and the DTPGs. Duplication of tests for snubbers considered in multiple FMGs corrective actions will not be required as long as the testing sufficiently demonstrates operational readiness under all of the applicable failure modes.

d. When snubbers have been tested as a part of DTPG test requirements and found to be unacceptable and evaluation establishes an FMG based on the failure of certain snubbers, the number of those unacceptable snubbers shall be used in determining testing in the FMG in accordance with Section 5.1.E.7. However, those snubbers shall be counted only in the value of N of Section 5.1.E.7 as completed tests in the DTPG.

e. If snubbers have been found to be acceptable when tested as part of DTPG test requirements and subsequent evaluation establishes an FMG that would include those snubbers, those snubbers shall not be counted in the value of N_F in Section 5.1.E.7 when counting FMG tests.

f. An FMG shall remain as defined until corrective action is complete.

g. When a snubber is assigned to more than one FMG, it shall be counted in each of those FMGs and shall be included in corrective action for each of those FMGs. Duplication of tests for snubbers considered in multiple FMGs corrective actions will not be required as long as the testing sufficiently demonstrates operational readiness under all of the applicable failure modes.

h. After the requirements of Section 5.1.E.7 are satisfied for a DTPG, any separate and additional FMG review or testing does not require additional tests in the DTPG.

i. Unacceptable snubbers shall be adjusted, repaired, modified, or replaced to ensure the operational readiness of the snubber. The provisions of Section 5.1.C.8.c still apply.

7. 10% Testing Sample Plan Completion

a. The snubbers of each DTPG and FMG shall be tested as required. Testing is complete when the mathematical expressions of Section 5.1.E.7.b are satisfied, or all snubbers in the DTPG or FMG have been tested.

b. Testing shall satisfy the mathematical expressions as follows:

(1) for each DTPG

$N \geq 0.1n + C(0.1n/2)$

where

N = total number of snubbers tested that were selected from the DTPG

n = number of snubbers in the DTPG

C = total number of unacceptable snubbers found in the DTPG (excluding those counted for FMG tests)

(2) for each FMG

$N_F \geq C_F(0.1n/2)$

where

N_F = all snubbers selected and tested from the FMG after the FMG was established from the DTPG

C_F = total number of unacceptable snubbers in the FMG, plus those found in the DTPG and used to establish the FMG

n = number of snubbers in the DTPG

8. Retests of Previously Unacceptable Snubbers

Snubbers placed in the same location as snubbers that failed the previous inservice operational readiness test shall be retested at the time of next operational readiness testing unless the cause of the failure is clearly established and corrected. Any retest in accordance with this paragraph shall not be considered a part of inservice operational readiness testing sample selection requirements. In addition, failures found by these retest shall not require additional testing scope in accordance with Section 5.1.E, however appropriate corrective actions shall be determined as necessary in accordance with Reference 2.2.D.

5.2 Service Life Monitoring (SLM)

The purpose of this Service Life Monitoring program is to establish a plan for monitoring the service life of each safety related and Seismic Category I snubber in accordance with ASME ISTD-6000, to assure that the indicated snubber service life for each snubber has not been exceeded or will not be exceeded prior to the next scheduled snubber Service Life Review.

A. Predicted Service Life

Before start of service, snubber service life should be conservatively predicted, based on manufacturer recommendations for design review.

1. Manufacturer recommendations may include seal and fluid replacement intervals for hydraulic snubbers or intervals for replacement of critical parts and/or lubricant for mechanical snubbers. Such intervals may vary, depending upon the application.

The following table lists the snubber manufacturer service life recommendations for the snubbers included in the Snubber Program. Service life for hydraulic snubber seals is considered to begin on the day the seals are installed in the snubber.

NOTE

Service life for hydraulic snubber seals is considered to begin on the day the seals are installed in the snubber. This may reduce the installed service life if the snubber is rebuilt in advance prior to the refueling outage. Ensure the snubber service life is adjusted accordingly.

Snubber Manufacturer	Recommended Service Life
ITT Grinnell	10 years
Anvil	25 years
Paul-Munroe	40 years
Bergen Paterson	10 years
Anker Holth	10 years
Pacific Scientific/Basic-PSA	40 years

NOTE

For Paul Munroe snubbers, the reservoir fill valve must be replaced every 10 years. To extend the valve replacement frequency beyond 10 years, the quick disconnect fittings shall be inspected for leak-tightness at intervals not to exceed 2 years. If the quick disconnect fittings are found to be leaking, the quick disconnect fitting shall be replaced or the snubber shall be replaced with a tested spare.

a. Hydraulic snubbers have been shown to be more durable than mechanical snubbers in operating plants, with the exception of the seals, which must be replaced upon a prescribed service interval. When determining the life of hydraulic snubber seals, consideration must be given to both service life and shelf life.

(1) Seal shelf life is defined as the maximum recommended period between the seal cure date and the date the seals are compressed (i.e., installed in the snubber).

(a) Recommended Storage Conditions:

- Ambient room temperature between 65°F – 85°F
- Humidity between 70% – 90% (see Note)
- No exposure to ozone permitted
- Assume minimal exposure to ultra violet light from natural sources and fluorescent lighting.

- Seals will be packaged in air-tight (possibly heat sealed) polyethylene bags with minimal air trapped within. They will be stored in a covered box, crate, or similar receptacle minimizing exposure to lighting. This method applies to both individual seals and kits.

(2) Based on the storage conditions specified previously, the shelf life for hydraulic snubber non-metallic materials are as follows:

Material	**Maximum Shelf Life (References: EPRI-NP-6408, 2.1.J)**
Ethylene Propylene (EP)	10 years
Viton	10 years
Teflon (back-up rings)	10 years
Tefzel	40 years
SF-1154 Fluid	Indefinite*
HB-40 Fluid	Indefinite*
*Indefinite shelf life of the fluid assumes the fluid is stored in a tightly sealed container	

b. Mechanical snubbers were introduced into the nuclear industry as an alternative to the early generation of hydraulic snubbers used to dynamically restrain piping systems. The Pacific Scientific mechanical snubber (the Pacific Scientific snubbers are now produced as Basic-PSA snubbers) was initially perceived by the industry as requiring no maintenance. Industry experience has shown mechanical snubber performance issues and current practices typically include monitoring and maintenance.

(1) Basic-PSA publication DR 1319 indicates PSA shock arrestors are designed for an effective service life of 40 years with appropriate maintenance and operating conditions maintained within their rated load and environmental limits (primarily ambient temperature).

(a) Normal temperature limits are defined as -20°F to 300°F. All mechanical snubbers installed at Ginna Station fall within these limits.

(b) Degradation of the grease within the mechanical snubber may occur when the operating temperature of the snubber is greater than 150°F. Although there are potential excursions where the temperature inside containment may exceed 150°F, this is not considered to be a significant degradation factor at Ginna.

(2) Using the worst case graphical data contained in Reference 2.1.M report for a PSA-1 snubber with NRRG-159 grease, degradation could begin after 7 years with sustained temperatures of 150°F. Likewise for PSA-1/4 and 1/2 size units, grease, degradation could begin after 18 years with sustained temperatures of 150°F. The grease in all other sizes of snubbers with the original grease, NRRG-159, exceeds 40 years of service time before any projected grease degradation.

(3) One indicator of degradation recommended by Basic PSA is the use of drag rate test data to screen snubbers for corrective action. Basic PSA has established a drag rate level of 2% (of rated load) as an indicator to initiate service or increased monitoring. If the drag rate is found to be below 2%, no specific maintenance is required. The Ginna Snubber Program has likewise established a level of 2% as an indicator for degradation replacement. If the drag rate for the mechanical snubber after the as left in service test is below 2%, no specific maintenance is required.

(4) The Ginna SLM program for mechanical snubbers includes replacement of the original NRRG-159 grease with NRRG-2 grease. All mechanical snubbers at Ginna shall be upgraded to NRRG-2, the schedule for this effort is prioritized by the program engineer based on risk. Based on the current schedule, greater than 95% of the mechanical snubbers in the population will contain NRRG-2 grease by the conclusion of the 2015 RFO. The remaining outliers are snubbers which have been replaced within the last 10 years, 100% of the mechanical snubbers will contain NRRG-2 greased by 2020.

Once the original NRRG-159 grease has been replaced with NRRG-2 grease, potential degradation due to temperature will no longer be a factor. To date, review of historical test data has not resulted in performance failures due to grease degradation.

(5) Beyond the initiative to upgrade mechanical snubber grease to NRRG-2, the SLM plan in use at Ginna also provides for testing of all mechanical snubbers on a frequency not to exceed fifteen years. (10% per 18 month

refueling cycle). Beginning in 2011, all mechanical snubbers removed for the 10% sample shall be maintained [Reference 2.2.FF] in compliance with one of the following methods:

(a) Mechanical snubbers may be re-greased after completion of the as-found inservice test before returning to service, OR

(b) Mechanical snubbers may be replaced with a pre-tested spare snubber from inventory which has been greased with NRRG-2.

Engineering approval is required, to declare that it is not necessary to install a re-greased snubber after testing. Engineering shall evaluate the impact on the service life and a Condition Report shall be initiated in accordance with Reference 2.2.D.

(6) If any snubber location appears to be overly harsh indicated by repeated degradation or failure, that cause will be evaluated and the location will be considered for a reduced service life.

2. Snubber design review should consider materials, design features, and the plant operating environment. Evaluation of the effects of the environment on critical snubber parts such as seals, hydraulic fluids, lubricants, platings, etc., should be particularly emphasized.

B. Service Life Evaluation Methods

Service life shall be evaluated at least once each fuel cycle, and increased or decreased, if warranted. Evaluation shall be based upon technical data from representative snubbers that have been in service in the plant, or other information related to service life. Examples of methods that can be used to obtain such data are described in Non-mandatory ISTD Appendix F.

For mechanical snubbers, the service life can be reset (the snubber is like new) if the snubber is re-greased and if necessary any degraded parts have been replaced.

For hydraulic snubbers, the service life can be reset (the snubber is like new) if the snubber seals/fluid are replaced and if necessary any degraded parts have been replaced.

If the evaluation indicates that service life will be exceeded before the next scheduled system or plant outage, one of the following actions shall be taken:

1. The snubber shall be replaced with a snubber for which the service life will not be exceeded before the next scheduled system or plant outage;

2. Technical justification shall be documented for extending the service life to or beyond the next scheduled system or plant outage;

3. The snubber shall be reconditioned such that its service life will be extended to or beyond the next scheduled system or plant outage.

C. Hydraulic snubbers may be evaluated for the SLM program by methods other than applying a load to the snubber piston rod. For these evaluations additional monitoring considerations apply.

1. Monitoring the particulate, viscosity and moisture content of one or more samples of hydraulic fluid from the main cylinder of the snubbers, may be accomplished using snubbers of the same design in similar (or more severe) environmental conditions.

2. Monitoring of piston seal, piston rod seal and cylinder seal integrity, may be accomplished by pressurization. Use of pressure less than the snubber rated load pressure may be used, pressure requirements shall be specified by the Snubber Program Owner.

D. Knowledge of the Operating Environment

Actual plant operating environments can differ significantly from original plant design specifications. Some snubbers may be subjected to localized high temperatures that are not representative of the general snubber population. Such applications may require augmented inspections or more frequent snubber overhaul or replacement than originally predicted. On the other hand, the operating environment for the majority of snubbers may be significantly less severe than described in plant design specifications. Unnecessary overhaul or replacement of such snubbers may increase the incidence of snubber failure by introducing handling or maintenance errors. It is important, therefore, that the operating environment be identified and an appropriate service life established.

Environmental parameters may include the following:

1. temperature

2. vibration

3. transient loading

4. radiation

5. humidity

6. airborne contaminants

7. leakage of adjacent components

Severe environments may be identified by plant operating data, direct measurement of environmental parameters, evaluation of the installed location [e.g., proximity to high-temperature components, or by examination of snubbers (or snubber parts)].

E. Direct Measurement of Environmental Parameters

Various types of instrumentation and equipment are available for direct measurement of environmental parameters such as temperature, vibration, radiation, and humidity. Such equipment may be used for specific snubber locations where severe environments are expected or as an aid in determining the cause of snubber degradation.

F. As-Found Testing

As-found testing of snubbers removed from service can identify degradation due to severe operating environments.

1. If snubber testing is performed for the purpose of Service Life Monitoring, in addition to the required testing sample, the results of such testing are not subject to additional testing in accordance with the 10% testing plan. However, the failures shall be evaluated to determine appropriate corrective actions per Reference 2.2.D.

2. Non-safety related, non-program snubbers may be tested for purposes of Service Life Monitoring in accordance with Reference 2.1.K and this PROGPLAN. The results of such testing are not subject to additional testing in accordance with the 10% testing plan. However, the failures shall be evaluated to determine appropriate corrective actions per Reference 2.2.D.

G. Knowledge of Operating Environment Effects

Reevaluation of a snubber service life should include a thorough knowledge of the effects of various operating environments on snubber performance. Such knowledge may not be readily available from the manufacturer and may require engineering evaluation, including monitoring of trendable degradation parameters for snubbers removed from service. This might include periodic measurement of potentially trendable test parameters, e.g., drag force for selected snubbers. Periodic disassembly and evaluation of snubber internal parts (e.g., seals, springs fluid, etc., may also be required).

H. Identification of Degraded Snubbers

Degraded snubbers may often be identified by visual examination of snubbers or snubber parts, by sampling of hydraulic fluid, or by evaluation of functional test data. Examination or testing failures shall be evaluated to determine the cause of the degradation and potential impacts to service life.

I. Trending

The following should be considered for trending:

1. establishment of trending parameters and associated baseline data

2. trending parameters should relate directly to the anticipated failure mode

3. reservoir fluid level is the most appropriate trending parameter for monitoring snubber leakage

4. trends may be more effectively identified using average rather than peak drag force

5. The impact of replacing a snubber, as opposed to re-greasing the existing snubber and reinstalling it into the same location.

J. Failure Cause Determination

Failures often result from influences not related to service time or service environment. Such influences include maintenance activities, construction activities, and manufacturing defects. It is important to ensure that service life is not unjustifiably influenced by such failures or degradation. Therefore, snubbers that failed inservice examinations or tests, and snubbers removed from service due to excessive degradation, should be evaluated to determine the cause of the degradation or failure.

1. Failure Evaluation Data Sheet (Attachment 6)

   Failure evaluation data sheets should include information pertaining to failure mode, failure mechanism, environment, service time, abnormal conditions, visual observations, test results, test observations and impact to service life.

2. Diagnostic Testing

   Diagnostic testing may be useful in identifying the failure or degradation mechanism.

K. Reduced Service Life

It may be necessary to shorten the service life of snubbers subjected to severe environments, such as excessively high temperatures and vibration. Snubbers in severe environments may require augmented surveillance, including "hands-on" evaluations (e.g., stroking or in-situ monitoring).

L. Extended Service Life

In many cases, where there has been minimal degradation due to the service environment, it may be appropriate to extend the previously established service life. Service life extension should be based on a technical evaluation of snubber performance that includes the current level of service-related degradation as well as the degradation rate.

M. Separate Service Life Populations

Depending on the significance of environmental extremes from one area in the plant to another, separate and distinct service life populations may be appropriate.

6.0 RECORDS

6.1 Work Orders

All completed work orders shall be submitted to records. The work orders shall include applicable visual examination reports, operational readiness testing results, completed removal/installation procedures, and any other applicable procedures, documents or records.

6.2 Snubber Exam/Test Failure Worksheet

All visual exam failures and/or operational readiness test failures need to be documented and evaluated on the worksheet in Attachment 6 to this document. The completed worksheets shall be attached to the applicable CR.

6.3 Snubber Program RFO Summary

At the completion of each RFO, the snubber program owner should complete the RFO Summary in accordance with Attachment 8 of this document and submit the report to DCO.

6.4 SNUB-PROGPLAN

Concluding each RFO, this document shall be reviewed and revised as necessary, to document changes to the Test Plan (including failures and scope expansions), to re-evaluate snubber Service Life and to incorporate any applicable lessons learned into the program plan.

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
AFU-3	AFW-300	SWH-32	S382-0352,3	Mech.	IB	253'	C381-0358,14	2"	2"	150			
AFU-31	AFW-100	AFW-34	S382-0352,31	Mech.	IB	253'	C381-0352,1	2"	2"	150			
AFU-34	AFW-100	AFW-39	S382-0352,34	Mech.	IB	253'	C381-0352,1	2 3/4"	2 3/4"	150			
AFU-52	AFW-100	AFW100-6	S382-0352,52	Mech.	IB	253'	C381-0352,2	1 7/8"	2 7/8"	150			
AFU-75	AFW-200	N200-18	S382-0352,75	Mech.	IB	253'	C381-0352,4	2"	2"	150			
AFU-98	AFW-400	N200-14	S382-0352,98	Mech.	IB	278'	C381-0352,4	2"	2"	150			
AFU-101	AFW-400	Ds100-9A	S382-0352,101	Mech.	IB	278'	C381-0352,3	3 1/4"	3 1/4"	150			
AFU-103	AFW-400	AFW400-1	S382-0352,103	Mech.	IB	278'	C381-0352,3	E – 2 1/2" W – 2 1/2"	2 7/8" 2 7/8"	150			2 Snubbers (E&W)
AFU-109	AFW-500	AFW-49	S382-0352,109	Hyd.	IB	278'	C381-0352,2	2 1/2"	2 1/4"	150			5" stroke
AFU-111	AFW-500	N100-15	S382-0352,111	Mech.	IB	278'	C381-0352,2	2"	1 13/16"	150			
AFU-123	AFW-500	N200-16	S382-0352,123	Mech.	IB	278'	C381-0352,2	2"	1 9/16"	150			
AFU-124	AFW-500	N200-17	S382-0352,124	Mech.	IB	278'	C381-0352,2	2"	2"	150			
BDU-16	SGB-200	SGBN1014	S382-0360,16	Mech.	RB	256'	C381-0350,6	1 1/2"	2 3/4"	508			
CCU-43	CC-450	RC-105N	S382-0356,43	Mech.	RB	264'	C381-0356,14	1"	1 7/8"	105			
CCU-57	CC-700	RC-33	S382-0356,57	Mech.	RB	267'	C381-0356,15	2 1/2"	2 3/16"	105			
CCU-71	CC-600	RC-32	S382-0356,71	Mech.	RB	267'	C381-0356,16	2 1/2"	2 5/16"	105			

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
CVU-26	CVC-730	-	S382-0357,26	Mech.	RB	242'	C381-0357,16	2"	1 15/16"	553			
CVU-46	CVC-300	-	S382-0357,46	Mech.	RB	244'	C381-0357,22	2"	1 5/8"	125			
CVU-49	CVC-700	-	S382-0357,49	Mech.	RB	241'	C381-0357,19	1 1/4"	1 1/2"	520			
CVU-80	CVC-100	CH-N1189	S382-0357,80	Mech.	RB	250'	C381-0357,11	1 15/16"	1 7/8"	290			
CVU-103	CVC-500	-	S382-0357,103	Mech.	RB	254'	C381-0357,32	2 1/4"	2 9/16"	125			
CVU-104	CVC-500	-	S382-0357,104	Mech.	RB	254'	C381-0357,32	2"	2 7/8"	125			
CVU-131	CVC-200	-	S382-0357,131	Mech.	RB	256'	C381-0357,34	2 1/2"	2 1/2"	170			
CVU-186	CVC-250	-	S382-0357,186	Mech.	RB	256'	C381-0357,28	1 1/2"	2 3/4"	170			
CVU-345	CVC-900	CVC-1A	S382-0357,345	Mech.	AB	235'	C381-0357,1	1 1/4"	1 1/16"	290			
CVU-351	CVC-900	CVC-2	S382-0357,351	Mech.	AB	235'	C381-0357,1	1 1/4"	7/8"	290			
CVU-372	CVC-1000	CV1000-6	S382-0357,372	Mech.	AB	235'	C381-0357,2	1 1/4"	1 1/4"	150			
CVU-550	CVC-200	CVU-XI	03021-983	Mech.	RB	259'	C381-0357,34	2 1/2"	2 1/2"	170			
CVU-590	-	H-145Z	10904-0209	Mech.	RB	259'	33013-0709	2 1/2"	*	170			*CR-2013-002267
CVU-591	-	H-145Y	10904-0208	Mech.	RB	259'	33013-0709	2 1/2"	*	170			*CR-2013-002267
FWU-3	FW-100	FW-3	S382-0351,3	Hyd.	RB	290'	C381-0351,5	4 1/16"	1 3/4"	432	Yes		6" stroke
FWU-5	FW-100	FW-5	S382-0351,5	Hyd.	RB	289'	C381-0351,5	2 1/8"	3 7/8"	432	Yes		6" stroke

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
FWU-8	FW-200	FW-9	S382-0351,8	Mech.	RB	289'	C381-0351,1	3"	1 5/8"	432	Yes		
FWU-12	FW-200	-	S382-0351,12	Mech.	RB	289'	C381-0351,1	3"	3 15/16"	432	Yes		
FWU-15	FW-301	-	S382-0351,15	Mech.	IB	278'	C381-0351,4	3"	2 9/16"	432	Yes		
FWU-17	FW-301	FW-25	S382-0351,17	Mech.	IB	278'	C381-0351,4	4 1/2"	5"	432	Yes		
FWU-18	FW-301	-	S382-0351,18	Mech.	IB	278'	C381-0351,4	3 1/2"	4 3/4"	432	Yes		
FWU-20	FW-301	FW-85	S382-0351,20	Mech.	TB	271'	C381-0351,3	3"	1 11/16"	432	Yes		
FWU-21	FW-301	FW-84	S382-0351,21	Hyd.	TB	271'	C381-0351,3	2 1/4"	3 1/8"	432	Yes		6" stroke
FWU-23	FW-301	-	S382-0351,23	Mech.	TB	271'	C381-0351,3	4 1/8"	3"	432	Yes		
FWU-24	FW-301	-	S382-0351,24	Mech.	TB	271'	C381-0351,3	2 1/8"	3"	432	Yes		
FWU-26	FW-301	-	S382-0351,26	Mech.	TB	271'	C381-0351,3	E – 2 3/4" W – 2 3/4"	3 3/8" 3 3/8"	432	Yes		2 Snubbers (E&W)
FWU-32	FW-300	-	S382-0351,32	Mech.	TB	271'	C381-0351,3	3"	3 3/16"	432	Yes		
FWU-38	FW-300	FW-30	S382-0351,38	Mech.	IB	278'	C381-0351,2	3 1/4"	2 3/4"	432	Yes		
FWU-39	FW-300	-	S382-0351,39	Mech.	IB	278'	C381-0351,2	3 1/8"	4"	432	Yes		
FWU-40	FW-300	-	S382-0351,40	Mech.	IB	278'	C381-0351,2	3 1/8"	3 5/8"	432	Yes		
FWU-42	FW-300	-	S382-0351,42	Mech.	IB	278'	C381-0351,2	4 3/8"	3 1/4"	432	Yes		
FWU-44	FW-300	FW-83	S382-0351,44	Hyd.	IB	278'	C381-0351,2	3 3/16"	4 5/16"	432	Yes		

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
FWU-47	FW-300	FW-82	S382-0351,47	Mech.	FAC	304'	C381-0351,2	4 3/4"	2 3/8"	432	Yes		
FWU-48	FW-300	FW-81	S382-0351,48	Mech.	FAC	304'	C381-0351,2	4 5/8"	2 5/8"	432	Yes		
FWU-51	FW-300	FW-21	S382-0351,51	Mech.	FAC	304'	C381-0351,2	4 3/8"	2 3/4"	432	Yes		
FWU-52	FW-300	FW-80	S382-0351,52	Mech.	FAC	304'	C381-0351,2	3"	2"	432	Yes		
FWU-54	FW-300	-	S382-0351,54	Mech.	FAC	305'	C381-0351,2	3 13/16"	3 ⅛"	432	Yes		
FWU-57	FW-300	-	S382-0351,57	Mech.	FAC	305'	C381-0351,2	3"	2 5/16"	432	Yes		
MSU-2	MS-100	MS-2	S382-0350,2	Mech.	RB	320'	C381-0350,1	3 5/8"	1 9/16"	508	Yes		
MSU-3	MS-100	MS-3	S382-0350,3	Mech.	RB	312'	C381-0350,1	3"	4 1/16"	508	Yes		
MSU-7	MS-200	MS-7	S382-0350,7	Mech.	RB	314'	C381-0350,1	T – 3" B – 3"	4 15/16" 4 15/16"	508	Yes		2 Snubbers (T&B)
MSU-8	MS-200	MS-8	S382-0350,8	Hyd.	RB	314'	C381-0350,1	3 3/4"	1 7/8"	508	Yes		6" stroke
MSU-12	MS-300	-	S382-0350,12	Mech.	FAC	313'	C381-0350,3	3 1/4"	3 3/4"	508	Yes		
MSU-13	MS-300		S382-0350,13	Mech.	FAC	312'	C381-0350,3	E – 3 3/4" W – 3 5/16"	3 1/2" 3 1/2"	508	Yes		2 Snubbers (E&W)
MSU-15	MS-300	MS-159	S382-0350,15	Mech.	FAC	312'	C381-0350,3	N – 3 3/4" S – 3 1/4"	4 3/8" 4 5/8"	508	Yes		2 Snubbers (N&S)
MSU-16	MS-300	-	S382-0350,16	Mech.	FAC	312'	C381-0350,3	N – 2 3/4"	3 5/8"	508	Yes		2 Snubbers

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
								S – 3 1/2"	4 3/16"				(N&S)
MSU-18	MS-300	MS-160	S382-0350,18	Mech.	FAC	312'	C381-0350,3	N – 1 3/4"	3 7/8"	508	Yes		2 Snubbers (N&S)
								S – 2 3/8"	3 7/8"				
MSU-19	MS-300	-	S382-0350,19	Mech.	FAC	312'	C381-0350,3	N – 2 1/2"	4 3/8"	508	Yes		2 Snubbers (N&S)
								S – 2 1/2"	4 3/8"				
MSU-22	MS-300	-	S382-0350,22	Mech.	FAC	311'	C381-0350,3	1 7/8"	4 1/2"	508	Yes		
MSU-25	MS-300	-	S382-0350,25	Mech.	FAC	311'	C381-0350,3	1 3/4"	4 1/2"	508	Yes		
MSU-26	MS-300	MS-146	S382-0350,26	Mech.	FAC	311'	C381-0350,3	T – 4 1/2"	1 1/4"	508	Yes		2 snubbers (T&B)
								B – 4 3/4"	1 1/2"	508			
MSU-27	MS-300	MS-148	S382-0350,27	Mech.	FAC	311'	C381-0350,3	1 3/8"	4 3/8"	508	Yes		
MSU-29	MS-300	-	S382-0350,29	Mech.	IB	298'	C381-0350,3	2 1/2"	4 1/4"	508	Yes		
MSU-31	MS-300	MS-147	S382-0350,31	Mech.	IB	298'	C381-0350,3	1 1/8"	3 ⅛"	508	Yes		
MSU-32	MS-300	-	S382-0350,32	Mech.	IB	298'	C381-0350,3	1 1/8"	2 $^{9}/_{16}$"	508	Yes		
MSU-38	MS-300	-	S382-0350,38	Mech.	IB	278'	C381-0350,2	3"	1 5/8"	508	Yes		
MSU-39	MS-300	-	S382-0350,39	Mech.	IB	298'	C381-0350,2	4 13/16"	3 1/2"	508	Yes		
MSU-40	MS-300	-	S382-0350,40	Mech.	IB	298'	C381-0350,2	3 3/4"	4 3/4"	508	Yes		
MSU-44	MS-300	MS-22	S382-0350,44	Mech.	IB	298'	C381-0350,2	3 1/2"	3 1/4"	508	Yes		

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
MSU-55	MS-300	PS-701-3	S382-0350,55	Mech.	IB	278'	C381-0350,3	3 3/16"	2"	508	Yes		
MSU-57	MS-300	PS-701-1	S382-0350,57	Mech.	IB	278'	C381-0350,3	3 7/16"	2 ¼"	508	Yes		
MSU-58	MS-300	PS-702-3	S382-0350,58	Mech.	IB	278'	C381-0350,2	3 1/16"	1 7/8"	508	Yes		
MSU-60	MS-300	PS-702-1	S382-0350,60	Mech.	IB	278'	C381-0350,2	3 15/16"	2 ¾"	508	Yes		
MSU-72	MS-120	-	S382-0350,72	Mech.	IB	253'	C381-0350,4	1 1/2"	3 1/16"	508	Yes		
MSU-74	MS-120	-	S382-0350,74	Mech.	IB	278'	C381-0350,4	3"	3 5/16"	508	Yes		
MSU-75	MS-120	-	S382-0350,75	Mech.	IB	278'	C381-0350,4	3 1/4"	2"	508	Yes		
MSU-78	MS-120	SNB-265	S382-0350,78	Mech.	IB	253'	C381-0350,4	3 3/8"	3"	508	Yes		
MSU-80	MS-120	-	S382-0350,80	Mech.	IB	253'	C381-0350,4	1 15/16"	2"	508	Yes		
MSU-82	MS-120	-	S382-0350,82	Mech.	IB	253'	C381-0350,4	2 1/2"	2 11/16"	508	Yes		
MSU-84	MS-120	-	S382-0350,84	Mech.	IB	278'	C381-0350,4	E – 3 1/4" W – 2 5/8"	2 5/8" 2"	508	Yes		2 snubbers (E&W)
MSU-85	MS-120	-	S382-0350,85	Mech.	IB	278'	C381-0350,4	2 1/8"	3 1/4"	508	Yes		
RHU-8	RH-100	-	S382-0354,8	Mech.	RB	239'	C381-0354,3	2 1/2"	2 1/4"	120			
RHU-30	RH-2500	-	S382-0354,8	Mech.	RB	238'	C381-0354,1	1"	1 3/4"	612		Yes	
RHU-33	RH-2500	RH-12	S382-0354,8	Mech.	RB	237'	C381-0354,1	3"	3 3/8"	612		Yes	
RHU-36	RH-350	ACH-N219	S382-0354,8	Mech.	AB	219'	C381-0354,6	2 1/2"	2 1/2"	120			

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
RHU-51	RH-400	ACH-N203	S382-0354,8	Mech.	AB	235'	C381-0354,8	2 1/2"	2 7/16"	120		Yes	
RHU-53	RH-400	ACH-N201	S382-0354,8	Mech.	AB	235'	C381-0354,8	2 1/2"	2 7/16"	120		Yes	
RHU-61	RH-400	-	S382-0354,8	Mech.	AB	235'	C381-0354,9	2 1/2"	2 1/2"	120			
RHU-63	RH-300	N214	S382-0354,8	Mech.	AB	226'	C381-0354,5	N – 3" S – 3"	3" 3"	120			2 Snubbers (N&S)
RHU-69	RH-300	N-215	S382-0354,8	Mech.	AB	226'	C381-0354,5	3"	3"	120			
RHU-71	RH-300	ACH-N213	S382-0354,8	Mech.	AB	219'	C381-0354,5	N – 2 1/2" S – 3"	3" 2 1/2"	120			2 Snubbers (N&S)
RHU-72	RH-300	ACH-52A	S382-0354,8	Mech.	AB	219'	C381-0354,5	3"	2 15/16"	70			
RHU-75	RH-300	-	S382-0354,8	Mech.	AB	219'	C381-0354,5	3"	3 1/16"	120			
RHU-92	RH-300	-	S382-0354,8	Mech.	AB	219'	C381-0354,4	2"	2"	70			
RHU-109	RH-450	-	S382-0354,8	Mech.	AB	242'	1869E53,3	2"	2"	70			
RHU-110	RH-450	-	S382-0354,8	Mech.	AB	243'	1869E53,3	2"	2"	70			
RHU-119	RH-450	-	S382-0354,8	Mech.	AB	243'	1869E53,2	1 7/8"	1 7/8"	120			
RHU-123	RH-450	-	S382-0354,8	Mech.	AB	238'	1869E53,3	2 1/2"	2 1/2"	70			
SIU-3	SI-100	-	S382-0355,3	Mech.	RB	243'	C381-0355,7	3"	2 3/16"	120			
SIU-47	SI-200	-	S382-0355,3	Mech.	RB	249'	C381-0355,8	3½"	3 15/16"	120			

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
SIU-52	SI-200	-	S382-0355,3	Mech.	RB	238'	C381-0354,3	2 1/2"	2 5/8"	612		Yes	
SWU-254	SW-1850	SWTH-39	S382-0358,254	Mech.	DGB	253'	C381-0358,40	1"	1 1/16"	70			
SWU-308	SW-1400	-	S382-0358,308	Mech.	IB	253'	C381-0358,9	2 1/2"	2 1/2"	200			
SWU-309	SW-1400	-	S382-0358,309	Mech.	IB	253'	C381-0358,9	3 3/8"	3 3/8"	200			
SWU-370	SW-1500	-	S382-0358,370	Mech.	IB	253'	C381-0358,13	2 3/8"	2 1/2"	200			
AFU-205	SAFW-800	FW-10	S382-0352,205	Hyd.	RB	277'	C381-0041	3 1/4"	3 3/8"	500			
AFU-208	SAFW-800	AFW-13	S382-0352,208	Hyd.	RB	279'	C381-0041	1 1/2"	1 3/4"	500			
AFU-209	SAFW-800	ADD SNUB	S382-0352,209	Hyd.	RB	289'	C381-0041	3 1/4"	4 3/4"	500			
AFU-224	SAFW-900	AFW-28	S382-0352,224	Hyd.	RB	280'	C381-0040	2 1/2"	3"	200			
AFU-225	SAFW-900	AFW-29	S382-0352,225	Hyd.	RB	285'	C381-0040	2 1/4"	3 1/8"	200			
AFU-226	SAFW-900	AFW-27	S382-0352,226	Hyd.	RB	287'	C381-0040	2 1/4"	2 1/2"	200			
AFU-227	SAFW-900	AFW-31	S382-0352,227	Mech.	RB	289'	C381-0040	4"	4 3/16"	200			
AFU-229	SAFW-900	ADD SNUB 900	S382-0352,229	Hyd.	RB	289'	C381-0040	1 1/2"	3 1/2"	500			
N601	PRZR Safety	H-6	03021-1229	Hyd.	RB	279'	C381-0353,7	1 7/8"	3 3/16"	653	Yes		5" stroke
N602	PRZR Safety	H-4	03021-1230	Hyd.	RB	283'	C381-0353,7	2 9/16"	2 7/16"	653	Yes		5" stroke

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
N604	PRZR Safety	H-3	03021-1231	Hyd.	RB	282'	C381-0353,6	1 1/2"	3/4"	653	Yes		5" stroke
N605	PRZR Safety	H-2	03021-1232	Hyd.	RB	282'	C381-0353,6	3 3/8"	2 5/8"	653	Yes		5" stroke
N607	PRZR Safety	H-1	03021-1233	Hyd.	RB	282'	C381-0353,6	3 1/2"	3 1/4"	653	Yes		5" stroke
N608	PRZR Safety	H-5	03021-1234	Hyd.	RB	279'	C381-0353,6	3 5/8"	3 1/4"	653	Yes		5" stroke
N615	PRZR Safety	H-8	03021-1235	Hyd.	RB	282'	C381-0353,6	2 1/8"	2 1/2"	653	Yes		5" stroke
N616	PRZR Safety	H-7	03021-1236	Hyd.	RB	283'	C381-0353,7	3 1/4"	3 5/8"	653	Yes		5" stroke
PS-2	PRZR PORV	-	03021-1245	Hyd.	RB	284'	C381-0353,4	4 3/8"	3"	653	Yes		Catalytic
PS-4	PRZR PORV	-	03021-1246	Hyd.	RB	282'	C381-0353,4	1 1/4"	1 3/4"	653	Yes		Catalytic
PS-5	PRZR PORV	-	03021-1247	Hyd.	RB	279'	C381-0353,4	2 3/4"	2 5/8"	653	Yes		Catalytic
PS-6	PRZR PORV	-	03021-1248	Hyd.	RB	278'	C381-0353,4	3 1/4"	3"	653	Yes		Catalytic
PS-8	PRZR PORV	-	03021-1249	Hyd.	RB	279'	C381-0353,5	2 5/8"	2 1/2"	653	Yes		Catalytic
PS-9	PRZR PORV	-	03021-1250	Hyd.	RB	280'	C381-0353,5	3 7/8"	3 3/4"	653	Yes		Catalytic

Attachment 1

Snubber Program Scope and Reference Table

Support No.	Analysis Line No.	Old Support No.	Support Dwg. #	Type	Bldg.	Elv.	Isometric Dwg. #	Cold Setting	Hot Setting	Hot Temp. (°F)	Credited for Hydraulic Loading	Common Train	Comments
PS-10	PRZR PORV	-	03021-1251	Hyd.	RB	282'	C381-0353,5	3 1/2"	2 1/4"	653	Yes		Catalytic
PS-11	PRZR PORV	-	03021-1252	Hyd	RB	284'	C381-0353,5	2 1/4"	2 3/8"	653	Yes		Catalytic
SGA-7	-	A-7	33013-1979,1	Hyd.	RB	278'	33013-1979	3' - 2 1/8"	3' - 3 1/8"	500			
SGA-8	-	A-8	33013-1979,1	Hyd.	RB	278'	33013-1979	3' - 2 1/4"	3' - 3 3/16"	500			
SGB-3	-	B-3	33013-1979,1	Hyd.	RB	278'	33013-1979	3' - 2 3/8"	3' - 3 7/16"	500			
SGB-4	-	B-4	33013-1979,1	Hyd.	RB	278'	33013-1979	3' - 2 9/16"	3' - 3 3/4"	500			

Attachment 2

Snubber Program Visual Examination Requirements for Determination of Snubber Settings

1.0 Snubber settings shall be verified to be consistent with the settings listed on the tables within this attachment. Settings shall be verified using a measurement procedure appropriate to the snubber type and manufacturer as described below.

2.0 The setting indicated as the hot setting on the tables refers to the process pipe being at the temperature indicated as the hot temperature. This temperature does not necessarily correspond to the plant conditions at 100% power. Unless otherwise indicated the cold temperature shall be the process pipe at ambient temperature.

3.0 Visual inspections shall verify the snubber set position is in accordance with the listed settings with a tolerance of ±¾".

4.0 Visual inspections shall verify the snubber set position is NOT within ½" of the end of the snubber's travel. Any snubber found in this condition is unacceptable even if within the setting tolerance.

5.0 Any snubbers found to have settings outside the allowable tolerances specified above shall be reported to Engineering for evaluation, a CR shall be initiated in accordance with Reference 2.2.D.

6.0 Measurement Requirements are as follows:

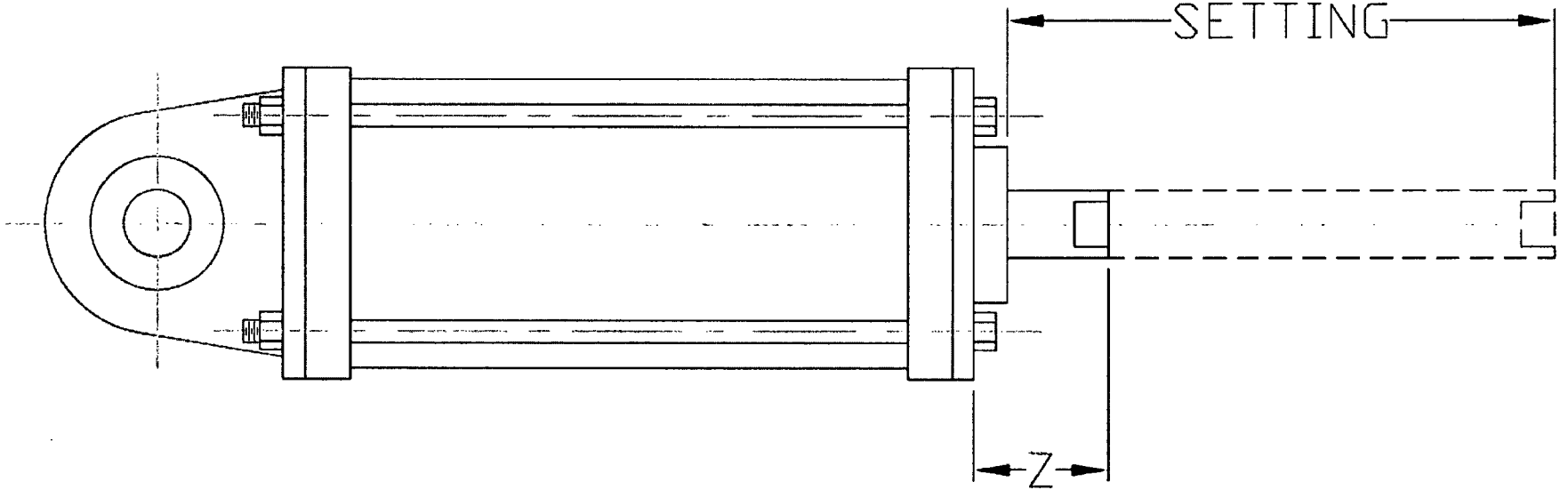
Attachment 2

Snubber Program Visual Examination Requirements for Determination of Snubber Settings

6.1 Grinnell

Measurement is taken from the end of the cylindrical portion of the snubber head to the beginning of the wrench flats on the snubber piston rod.

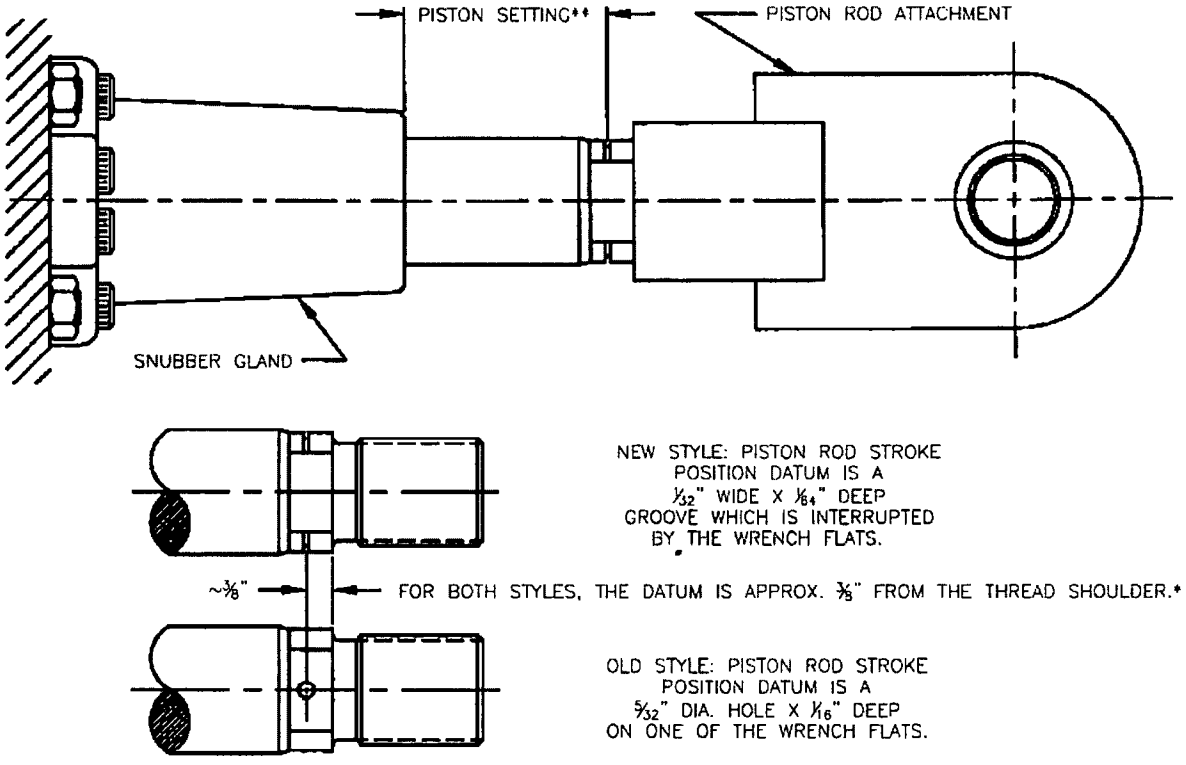
Size (Bore) in.	Z (in)
1-1/2	5/8
2-1/2	1



Grinnell/Anvil Fig. 200/201

6.2 **Bergen-Paterson**

Measurement is taken from the end of the cylindrical portion of the snubber head to the prick-punch mark (or other specified datum) on the wrench flats on the snubber piston rod.



NOTE:
*IN THE CASE THAT THE DATUM IS NOT MARKED, MEASURE TO SHOULDER AND SUBTRACT 3/8" TO DETERMINE THE PISTON SETTING.

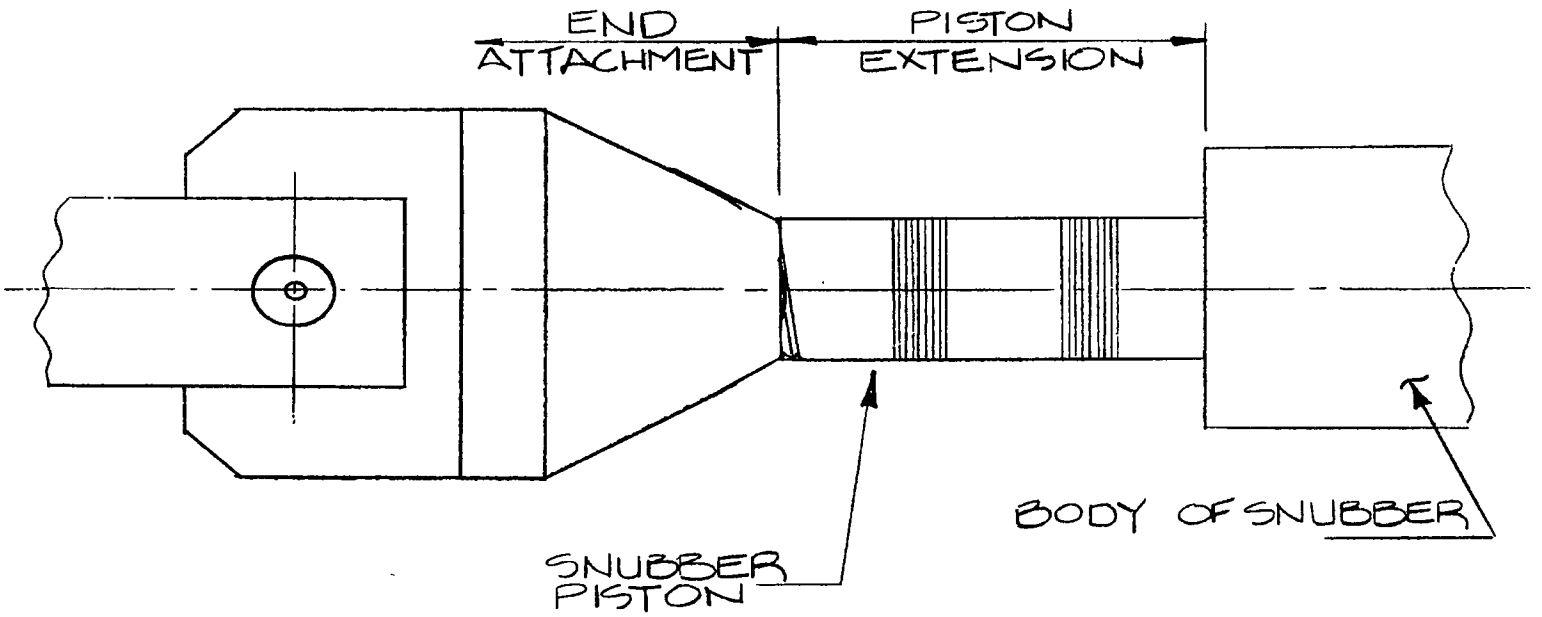
**FULLY RETRACTED PISTON SETTING IS 3/4".

Attachment 2

Snubber Program Visual Examination Requirements for Determination of Snubber Settings

6.3 Paul-Munroe

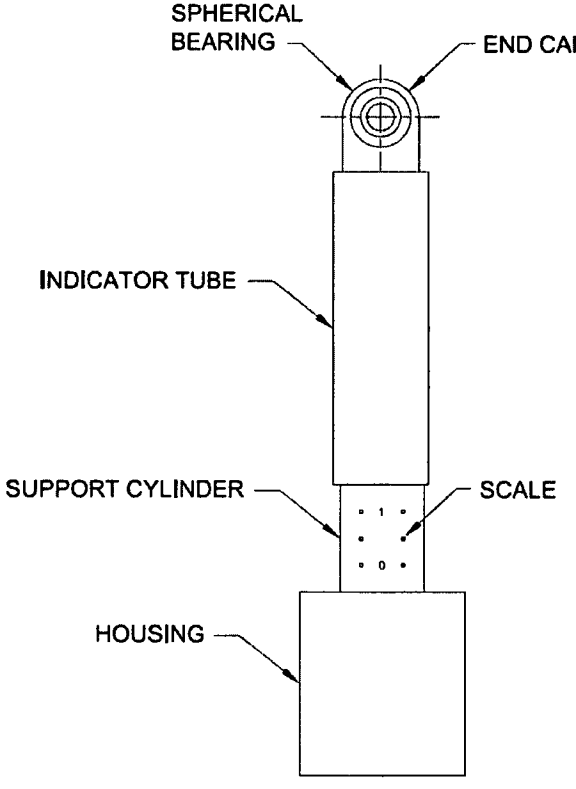
6.4 Measurement is taken from the end of the snubber body to the beginning of the end attachment on the piston.



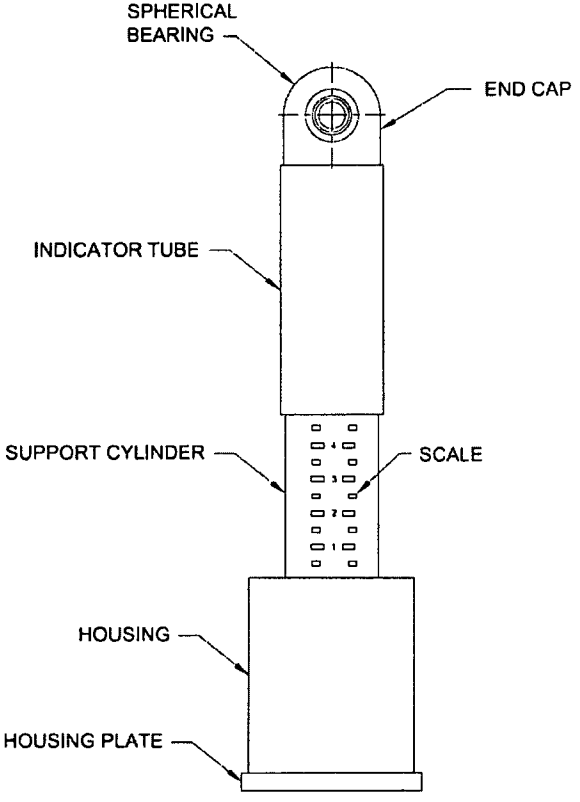
PAUL MUNROE ONLY

6.5 Pacific-Scientific

The setting may be determined by reading the graduations stenciled on the snubber support cylinder assembly. The convention for reading the stenciled marks shall be to use the lower edge of the graduation lines as the measurement point. A ruler, tape measure, etc., may be used to measure position of the assembly should the stenciled marks be illegible. The measurement in this case is taken from the edge of the snubber housing along the support cylinder to the edge of the position indicator tube.



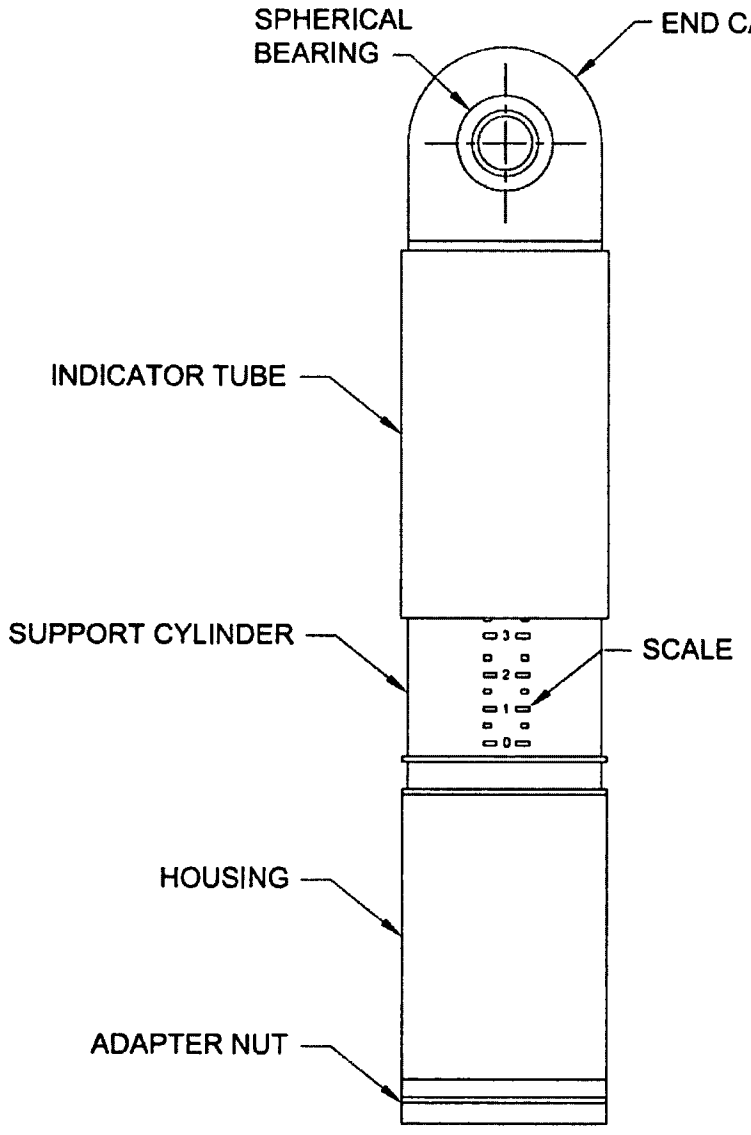
PSA - ¼ & PSA - ½



PSA - 1, PSA - 3 & PSA-10

Attachment 2

Snubber Program Visual Examination Requirements for Determination of Snubber Settings



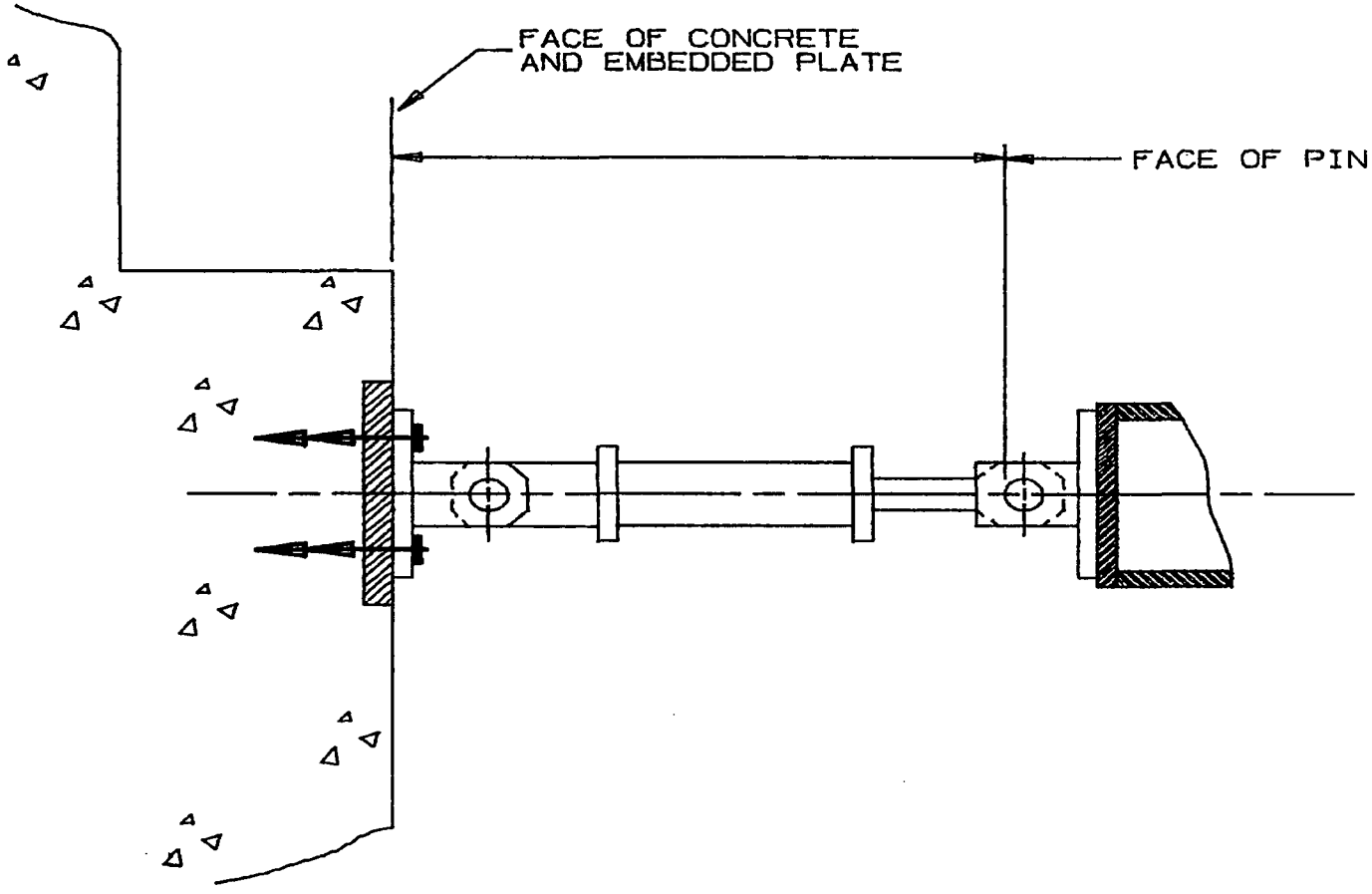
PSA - 35 & PSA - 100

If a protection bellows is installed on the snubber, the snubber setting may be determined by measuring the as-found dimension and subtracting the fully-retracted dimension, as follows:

- PSA-10 – Measure from centerline of eye on the moveable end to the edge of the housing plate and subtract 17.25 inches.
- PSA-35 – Measure from centerline of eye on the movable end to the leading edge of the housing ring and subtract 23.625 inches.
- PSA-100 – Measure from centerline of eye on the moveable end to the leading edge of the housing ring and subtract 28.75 inches.

6.6 Anker-Holth

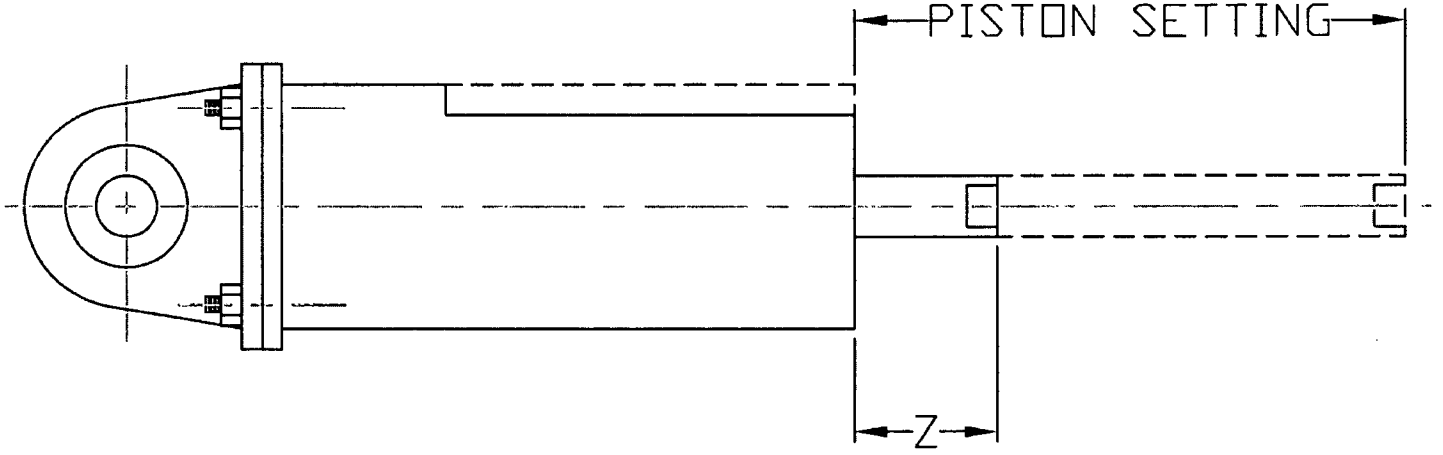
Measurement is taken from the face of the concrete and embedded plate to the face of the Steam Generator side load pin.



6.7 Anvil

- For Figures 200N and 201N, Configuration A snubbers, see Grinnell section 3.1.
- For Figures 3306N and 3307N, Measure from the cylinder head to the end of the piston rod. The dimension Z is this distance with the snubber fully contracted.

Size	Z (in.)
1/4	0.19
1/2	0.19
1	0.19
35	1.48

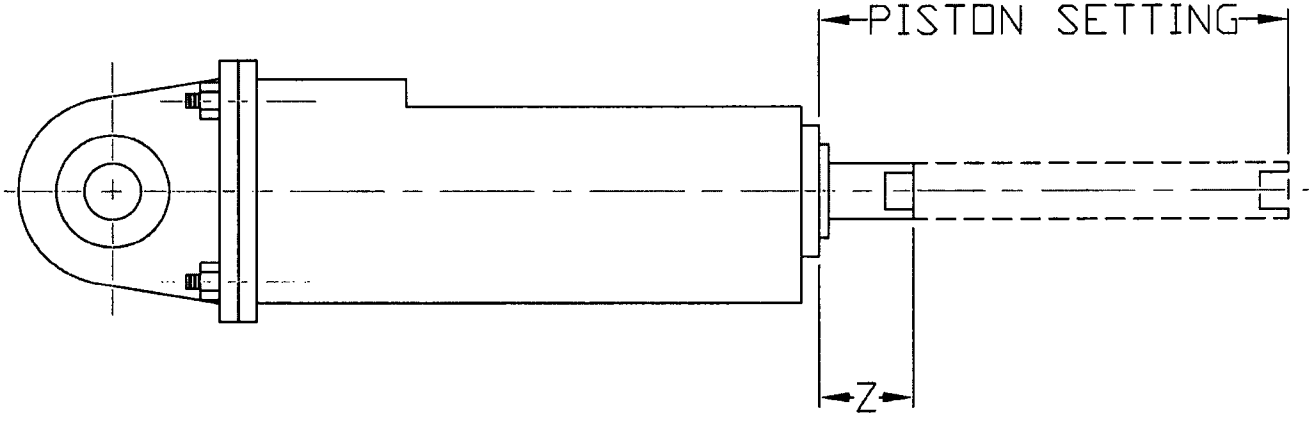


Anvil Fig. 3306N/3307N
Size 1/4, 1/2, 1 & 35 Only

Attachment 2

Snubber Program Visual Examination Requirements for Determination of Snubber Settings

Size	Z (in.)
3	1.25
10	2.10



Anvil Fig. 3306N/3307N
Size 3 & 10 Only

Attachment 3

Snubber Program Visual Examination Interval Determination

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE

Population or Category Size (Note 1)	Number of Unacceptable Snubbers		
	Column A Extend Interval (Notes 2 and 3)	Column B Repeat Interval (Notes 2, 4 and 5)	Column C Reduce Interval (Notes 2, 5 and 6)
1	0	0	1
80	0	0	2
100	0	1	4
150 (Ginna Pop. 151)	**0**	**3**	**8**
200	2	5	13
300	5	12	25
400	8	18	36
500	12	24	48
750	20	40	78
1000 or greater	29	56	109

NOTE

1. Interpolation between population or category sizes and the number of unacceptable snubbers is permissible. The next lower integer shall be used when interpolation results in a fraction.
2. The basic interval shall be the normal fuel cycle up to 24 months. The examination interval may be as great as twice, the same, or as small as fractions of the previous interval as required by the following notes. The examination interval may vary ± 25% of the current interval.
3. If the number of unacceptable snubbers is equal to or less than the number in Column A, then the next examination interval may be increased to twice the previous examination interval, not to exceed 48 months. In that case, the nest examination according to the previous interval may be skipped.
4. If the number of unacceptable snubbers exceeds the number in Column A, but is equal to or less than the number in Column B, then the next visual examination shall be conducted at the same interval as the previous interval.
5. If the number of unacceptable snubbers exceeds the number in Column B, but is equal to or less than the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous examination interval or, in accordance with the interpolation between Columns B and C, in proportion to the exact number of unacceptable snubbers.
6. If the number of unacceptable snubbers exceeds the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous interval.
7. To determine the next surveillance interval, an unacceptable snubber may be reclassified as acceptable if it can be demonstrated that the snubber is operable in its as-found condition by performance of a functional test and if it satisfies the acceptance criteria for functional testing.

Attachment 3

Snubber Program Visual Examination Interval Determination

CODE CASE OMN-13

Requirements for Extending Snubber Inservice Visual Examination Interval at LWR Power Plants

1.0 The OMN-13 Code Case allows for the visual examination of 100% of the Safety Related Snubber population to be completed once every 10 years. Implementation of this Code Case will result in cost savings as well as reduced ALARA. At Ginna the limit shall be established at 9 years, based on the 18 month refueling cycle.

2.0 Code Case OMN-13 has been accepted and approved for use by the NRC, per Reference 2.1.L.

3.0 Prior to implementation of the OMN-13 Code Case the prerequisite requirements as stated in the Code Case must be met.

4.0 In addition to the specific requirements for implementation which are described in the OMN-13 Code Case, the following shall apply.

4.1 Frequency of Examinations

4.2 If at any time during an examination interval the cumulative number of unacceptable snubbers exceeds the applicable value from Column B in Table ISTD-4252-1, the current examination interval shall end, and all remaining examinations must be completed within the current fuel cycle. The duration of the subsequent examination interval shall be reduced in accordance with Table ISTD-4252-1, using the examination interval prior to implementing the code case as the base interval. The beginning of the subsequent fuel cycle shall be the starting date for the new examination interval

4.3 Examination Corrective Action

The following actions shall be taken for snubbers that do not meet examination requirements:

A. An evaluation shall be conducted to determine the cause of the unacceptability.

B. Unacceptable snubbers shall be adjusted, repaired, modified, or replaced

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
AFU-3	MECH	PSA-1								X								
AFU-31	MECH	PSA-1		X									X					
AFU-34	MECH	PSA-1						X										X
AFU-52	MECH	PSA-1					X								X			
AFU-75	MECH	PSA-1						X										X
AFU-98	MECH	PSA-1									X							#
AFU-101	MECH	PSA-3								X								
AFU-103W	MECH	PSA-3	X									X						
AFU-103E	MECH	PSA-3	X									X						
AFU-111	MECH	PSA-1	X									X						
AFU-123	MECH	PSA-1						X										X
AFU-124	MECH	PSA-1			X									X				
AFU-227	MECH	PSA-3							X									
BDU-16	MECH	PSA-3						X										X
CCU-43	MECH	PSA-1								X								
CCU-57	MECH	PSA-3				X										X		
CCU-71	MECH	PSA-3			X									X				

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
CVU-26	MECH	PSA-1					X										X	
CVU-46	MECH	PSA-1/4				X										X		
CVU-80	MECH	PSA-1/4				X		X								X		
CVU-103	MECH	PSA-1	X								X	X						
CVU-104	MECH	PSA-1	X										X					
CVU-131	MECH	PSA-3							X									
CVU-186	MECH	PSA-1									X							
CVU-49	MECH	PSA-1/2			#							X						
CVU-345	MECH	PSA-1/2	X		#								X					
CVU-351	MECH	PSA-1/2			X	#									X			
CVU-372	MECH	PSA-1/2			#	#		X										X
CVU-550	MECH	PSA-3								X								
FWU-8	MECH	PSA-10		X									X					
FWU-12	MECH	PSA-10		X										X				
FWU-32	MECH	PSA-35								X								
FWU-38	MECH	PSA-35									X							
FWU-39	MECH	PSA-35									X							
FWU-40	MECH	PSA-35									X							
FWU-42	MECH	PSA-35							X									

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
FWU-47	MECH	PSA-35									X							
FWU-48	MECH	PSA-35	X										X			X		
FWU-51	MECH	PSA-35	X										X					
FWU-52	MECH	PSA-10		X										X				
FWU-54	MECH	PSA-35			X										X			
FWU-57	MECH	PSA-10		X										X				
FWU-15	MECH	PSA-35									X							
FWU-17	MECH	PSA-35										X						
FWU-18	MECH	PSA-35							X									
FWU-20	MECH	PSA-35	X										X					
FWU-23	MECH	PSA-10							X									
FWU-24	MECH	PSA-10								X								
FWU-26W	MECH	PSA-3								X								
FWU-26E	MECH	PSA-3								X								
MSU-72	MECH	PSA-3			#				X									
MSU-74	MECH	PSA-10			X	#									X			
MSU-75	MECH	PSA-10			#	X										X		
MSU-78	MECH	PSA-10			#			X										X
MSU-80	MECH	PSA-3		X	#									X				

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
MSU-82	MECH	PSA-3			X										X			
MSU-84E	MECH	PSA-3			#	#	X									X		
MSU-84W	MECH	PSA-3			#	#	X									X		
MSU-85	MECH	PSA-10			#							X						#
MSU-2	MECH	PSA-35		X										X				
MSU-3	MECH	PSA-35		X										X				
MSU-38	MECH	PSA-100			X										X			
MSU-39	MECH	PSA-100				X										X		
MSU-40	MECH	PSA-100					X										X	X
MSU-44	MECH	PSA-100						X										X
MSU-58	MECH	PSA-3			#				X			X				X		
MSU-60	MECH	PSA-3			#	#		#			X			X				X
EAST MSU-7**	MECH	PSA-35			X										X			
WEST MSU-7**	MECH	PSA-35			X										X		X	
MSU-12	MECH	PSA-35				X		X					X				#	X
MSU-13E	MECH	PSA-100									X						#	
MSU-13W	MECH	PSA-100										X					#	

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
(BOTTOM) MSU-15S	MECH	PSA-35				X										X		#
(BOTTOM) MSU-15N	MECH	PSA-35				X										X	XF	
(TOP) MSU-16N	MECH	PSA-35					X										#	
(TOP) MSU-16S	MECH	PSA-35					X										#	
(BOTTOM) MSU-18S	MECH	PSA-35						X	XF									X
(BOTTOM) MSU-18N	MECH	PSA-35						X										X
(TOP) MSU-19S	MECH	PSA-35							X							X		#
(TOP) MSU-19N	MECH	PSA-35						#	X							X		#
MSU-22	MECH	PSA-35							X									
MSU-25	MECH	PSA-100		X									X					
MSU-26T	MECH	PSA-35					X										X	
MSU-26B	MECH	PSA-35			#	#	X										X	XF
MSU-27	MECH	PSA-35			X										X		#	
MSU-29	MECH	PSA-100								X							#	
MSU-31	MECH	PSA-35					X										#	
MSU-32	MECH	PSA-100								X								

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
MSU-55	MECH	PSA-3			#		X				X					X		#
MSU-57	MECH	PSA-3			#	#		X	XF				X					X
RHU-8	MECH	PSA-3					X										X	
RHU-63N	MECH	PSA-1										X						
RHU-63S	MECH	PSA-1										X						
RHU-69	MECH	PSA-10	X										X					
RHU-71N	MECH	PSA-1		X										X				
RHU-71S	MECH	PSA-1		X										X				
RHU-72	MECH	PSA-10				X											X	
RHU-75	MECH	PSA-10									X							
RHU-92	MECH	PSA-1			#							X						
RHU-36	MECH	PSA-3			X										X			
RHU-51	MECH	PSA-3				X											X	
RHU-53	MECH	PSA-3					X										X	
RHU-61	MECH	PSA-3									X							
RHU-109	MECH	PSA-1							X									
RHU-110	MECH	PSA-1								X								
RHU-119	MECH	PSA-3					X										X	
RHU-123	MECH	PSA-3							X									

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
RHU-30	MECH	PSA-35									X							
RHU-33	MECH	PSA-35									X							
SIU-3	MECH	PSA-10									X							
SIU-47	MECH	PSA-3	X							X								X
SIU-52	MECH	PSA-3				X									X			
SWU-254	MECH	PSA-1/2	X		#								X					
SWU-308	MECH	PSA-10		X	#									X				
SWU-309	MECH	PSA-10			X										X			
SWU-370	MECH	PSA-1				X										X		
AFU-109	HYDR	ANVIL 1.5	X							O		X				O		
AFU-205	HYDR	ANVIL 1.5			X	#	#					O	X			X	XF	
AFU-208	HYDR	ANVIL 1.5						X	XF	X						X		
AFU-209	HYDR	ANVIL 1.5		X					XO					XO		X	XF	
AFU-224	HYDR	ANVIL 1.5						#	XF	XO				O		X	XF	
AFU-225	HYDR	ANVIL 1.5			#		X		X	O					O	X		
AFU-226	HYDR	ANVIL 1.5						#	X	O						XO		
AFU-229	HYDR	ANVIL 1.5						#	X	O					O	X		

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
FWU-3	HYDR	HSSA-10					X		XO			O			X			
FWU-5	HYDR	HSSA-10						X			O	O					X	
FWU-21	HYDR	HSSA-20								x		O						
FWU-44	HYDR	HSSA-30						X			O	O						X
MSU-8	HYDR	HSSA-20										O	XO					
N601	HYDR	GRINNELL-2.5			#		XO							XO				
N602	HYDR	GRINNELL-2.5		X							O	X		O				O
N604	HYDR	GRINNELL-2.5									XO					X	O	
N605	HYDR	GRINNELL-2.5	X		#				X		O		X	O		X		
N607	HYDR	GRINNELL-2.5								XO						XO	XF	
N608	HYDR	GRINNELL-2.5				X				XO					XO			
N615	HYDR	GRINNELL-2.5								O	X					O		
N616	HYDR	GRINNELL-2.5						#	XO						O			X
PS-2	HYDR	PMH-2103			X	#									X			
PS-4	HYDR	PMH-2103			#	X										X		
PS-5	HYDR	PMH-2103				X					X					X		

Attachment 4

Snubber Program Testing Plan

TABLE 4.1 – SNUBBER TESTING PLAN HISTORY (3rd Test Interval 1990 – 1999 & 4th Test Interval 2000 – 2009)

SNUBBER EIN	TYPE	MODEL NO.	90 *	91 *	92 *	93 *	94	95	96	97	99	00	02	03 %	05	06 %	08	09
PS-6	HYDR	PMH-2103						#	X		X							
PS-8	HYDR	PMH-2103								X							X	
PS-9	HYDR	PMH-2103		X	#									X				
PS-10	HYDR	PMH-2103					X						X					
PS-11	HYDR	PMH-2103	X								X							
SGA-7	HYDR	ANKER-HOLTH 532 Kip	X				X				XO				X			O
SGA-8	HYDR	ANKER-HOLTH 532 Kip			X				X				XO				X	
SGB-3	HYDR	ANKER-HOLTH 532 Kip		X				X				XO				X		O
SGB-4	HYDR	ANKER-HOLTH 532 Kip				X				X				XO				X

Notes for Table 4.1:

* Historical data

** Due to the actual configuration, MSU-7 snubbers should be labeled top and bottom, as opposed to east and west. In 2008, MSU-7 west (bottom) was tested without east (Top).

– Part of an additional testlLot

O – Seal replacement required

XF – Follow up test, failed the previous year

% – 100% of the program population visually examine

Attachment 4

Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
DEFINED TEST PLAN GROUP 1 – STEAM GENERATOR SNUBBERS (TOTAL POPULATION = 4)																		
SGA-7	1	HYDR	532 Kip	02	*RB 278'*	XO				XO				XO				XO
SGA-8	1	HYDR	532 Kip	02	*RB 278'*			XO				XO				XO		
SGB-3	1	HYDR	532 Kip	02	*RB 278'*		XO				XO				XO			
SGB-4	1	HYDR	532 Kip	02	*RB 278'*				XO				XO				XO	
DEFINED TEST PLAN GROUP 2 – SMALL MECHANICAL SNUBBERS; PSA-1/4 & PSA-1/2 (DTPG 2 POPULATION = 9)																		
CVU-46	2	MECH	PSA-1/4	07	*RB 244'*					X							X	
CVU-49	2	MECH	PSA-1/2	07	*RB 241'*	X										X		
CVU-80	2	MECH	PSA-1/4	07	*RB 250'*						X							
CVU-345	2	MECH	PSA-1/2	07	*AB 235'*		X										X	
CVU-351	2	MECH	PSA-1/2	07	*AB 235'*				X									
CVU-372	2	MECH	PSA-1/2	07	*AB 235'*							X						
CVU-590*	2	MECH	PSA-1/4	07	*RB 256'*			CA					X					
CVU-591*	2	MECH	PSA-1/4	07	*RB 256'*			CA						X				
SWU-254	2	MECH	PSA-1/2	08	*DGB 253'*			X							X			X

Attachment 4

Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
DEFINED TEST PLAN GROUP 3 – MEDIUM MECHANICAL SNUBBERS; PSA-1, PSA-3 & PSA-10 (DTPG 3 POPULATION = 67)																		
AFU-3	3	MECH	PSA-1	08	*IB 253'*	SLT	X									X		
AFU-31	3	MECH	PSA-1	04	*IB 253'*	SLT				X								
AFU-34	3	MECH	PSA-1	04	*IB 253'*	SLT				X								
AFU-52	3	MECH	PSA-1	04	*IB 253'*	SLT							X					
AFU-75	3	MECH	PSA-1	04	*IB 253'*	SLT									X			
AFU-98	3	MECH	PSA-1	04	*IB 278'*	SLT		X									X	
AFU-101	3	MECH	PSA-3	04	*IB 278'*		X									X		
AFU-103E	3	MECH	PSA-3	04	*IB 278'*	#			X									X
AFU-103W	3	MECH	PSA-3	04	*IB 278'*	#			X									X
AFU-111	3	MECH	PSA-1	04	*IB 278'*	SLT				X								
AFU-123	3	MECH	PSA-1	04	*IB 278'*	SLT									X			
AFU-124	3	MECH	PSA-1	04	*IB 278'*	SLT						X						
AFU-227	3	MECH	PSA-3	04	*RB 289'*	X	SF								X			
BDU-16	3	MECH	PSA-3	83	*RB 256'*		#							X				
CCU-43	3	MECH	PSA-1	09	*RB 264'*	SLT				X								
CCU-57	3	MECH	PSA-3	09	*RB 267'*								X					

Attachment 4

Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
CCU-71	3	MECH	PSA-3	09	*RB 267'*		#						X					
CVU-26	3	MECH	PSA-1	07	*RB 242'*	SLT								X				
CVU-103	3	MECH	PSA-1	07	*RB 254'*	SLT		X									X	
CVU-104	3	MECH	PSA-1	07	*RB 254'*	SLT					X							
CVU-131	3	MECH	PSA-3	07	*RB 256'*	X								X				
CVU-186	3	MECH	PSA-1	07	*RB 256'*	SLT		X									X	
CVU-550	3	MECH	PSA-3	07	*RB 259'*		X									X		
FWU-8	3	MECH	PSA-10	84B	*RB 289'*		#	XF	X									X
FWU-12	3	MECH	PSA-10	84B	*RB 289'*		#	XD	X									X
FWU-23	3	MECH	PSA-10	84B	*TB 271'*		X	XF									X	
FWU-24	3	MECH	PSA-10	84B	*TB 271'*		X	XF									X	
FWU-26E	3	MECH	PSA-3	84B	*TB 271'*	#	X										X	
FWU-26W	3	MECH	PSA-3	84B	*TB 271'*		X										X	
FWU-52	3	MECH	PSA-10	84B	*FAC 304'*		#				X							
FWU-57	3	MECH	PSA-10	84B	*FAC 305'*		#				X							
MSU-55	3	MECH	PSA-3	81	*IB 278'*		M			X								
MSU-57	3	MECH	PSA-3	81	*IB 278'*	XF	M			X								

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
MSU-58	3	MECH	PSA-3	81	*IB 278'*		M		X									X
MSU-60	3	MECH	PSA-3	81	*IB 278'*		#		X									X
MSU-72	3	MECH	PSA-3	81	*IB 253'*	X									X			
MSU-74	3	MECH	PSA-10	81	*IB 278'*	#	M					X						
MSU-75	3	MECH	PSA-10	81	*IB 278'*	M						X						
MSU-78	3	MECH	PSA-10	81	*IB 253'*		X	XF			X							
MSU-80	3	MECH	PSA-3	81	*IB 253'*						X							
MSU-82	3	MECH	PSA-3	81	*IB 253'*							X						
MSU-84E	3	MECH	PSA-3	81	*IB 278'*		#				X							
MSU-84W	3	MECH	PSA-3	81	*IB 278'*		#				X							
MSU-85	3	MECH	PSA-10	81	*IB 278'*	M				X								
RHU-8	3	MECH	PSA-3	03	*RB 239'*										X			
RHU-36	3	MECH	PSA-3	03	*AB 219'*							X						
RHU-51	3	MECH	PSA-3	03	*AB 235'*										X			
RHU-53	3	MECH	PSA-3	03	*AB 235'*										X			
RHU-61	3	MECH	PSA-3	03	*AB 235'*		#		X									X
RHU-63N	3	MECH	PSA-1	03	*AB 226'*	SLT						X						

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
RHU-63S	3	MECH	PSA-1	03	*AB 226'*	SLT						X						
RHU-69	3	MECH	PSA-10	03	*AB 226'*			X										
RHU-71N	3	MECH	PSA-1	03	*AB 219'*	SLT		X										
RHU-71S	3	MECH	PSA-1	03	*AB 219'*	SLT		X										
RHU-72	3	MECH	PSA-10	03	*AB 219'*			X										
RHU-75	3	MECH	PSA-10	03	*AB 219'*		#							X				
RHU-92	3	MECH	PSA-1	03	*AB 219'*	SLT								X				
RHU-109	3	MECH	PSA-1	05	*AB 242'*	X										X		
RHU-110	3	MECH	PSA-1	05	*AB 243'*	X										X		
RHU-119	3	MECH	PSA-3	05	*AB 243'*		#							X				
RHU-123	3	MECH	PSA-3	05	*AB 238'*	X										X		
SIU-3	3	MECH	PSA-10	05	*RB 243'*									X				
SIU-47	3	MECH	PSA-3	05	*RB 249'*	X										X		
SIU-52	3	MECH	PSA-3	03	*RB 238'*		#						X					
SWU-308	3	MECH	PSA-10	08	*IB 253'*		#						X					
SWU-309	3	MECH	PSA-10	08	*IB 253'*								X					
SWU-370	3	MECH	PSA-1	08	*IB 253'*	SLT							X					

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
DESIGNED TEST PLAN GROUP 4 – LARGE MECHANICAL SNUBBERS; PSA-35 & PSA-100 (DTPG 4 POPULATION = 42)																		
FWU-15	4	MECH	PSA-35	84B	*IB 278'*			X								X		
FWU-17	4	MECH	PSA-35	84B	*IB 278'*				X									X
FWU-18	4	MECH	PSA-35	84B	*IB 278'*	X												
FWU-20	4	MECH	PSA-35	84B	*TB 271'*					X								
FWU-32	4	MECH	PSA-35	84B	*IB 271'*		X								X			
FWU-38	4	MECH	PSA-35	84B	*IB 278'*		S		X								X	
FWU-39	4	MECH	PSA-35	84B	*IB 278'*		S		X								X	
FWU-40	4	MECH	PSA-35	84B	*IB 278'*		S		X								X	
FWU-42	4	MECH	PSA-35	84B	*IB 278'*	X	S							X				
FWU-47	4	MECH	PSA-35	84B	*FAC 304'*		S	X								X		
FWU-48	4	MECH	PSA-35	84B	*FAC 304'*		S			X								X
FWU-51	4	MECH	PSA-35	84B	*FAC 304'*		S				X							
FWU-54	4	MECH	PSA-35	84B	*FAC 305'*		S						X					
MSU-2	4	MECH	PSA-35	81	*RB 320'*						X							
MSU-3	4	MECH	PSA-35	81	*RB 312'*						X							
MSU-7B	4	MECH	PSA-35	81	*RB 314'*							X						

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
MSU-7T	4	MECH	PSA-35	81	*RB 314'*							X						
MSU-12	4	MECH	PSA-35	81	*FAC 313'*		SLI						X					
MSU-13E	4	MECH	PSA-100	81	*FAC 312'*		SLI					X						
MSU-13W	4	MECH	PSA-100	81	*FAC 312'*		SLI					X						
MSU-15N (B)	4	MECH	PSA-35	81	*FAC 312'*		SLI		X								X	
MSU-15S (B)	4	MECH	PSA-35	81	*FAC 312'*		X										X	
MSU-16N (T)	4	MECH	PSA-35	81	*FAC 312'*		SLI			X								X
MSU-16S (T)	4	MECH	PSA-35	81	*FAC 312'*		SLI			X								X
MSU-18N (B)	4	MECH	PSA-35	81	*FAC 312'*		SLI							X				
MSU-18S (B)	4	MECH	PSA-35	81	*FAC 312'*	XF	SLT								X			
MSU-19N (T)	4	MECH	PSA-35	81	*FAC 312'*		SLI				X							
MSU-19S (T)	4	MECH	PSA-35	81	*FAC 312'*		SLI						X					
MSU-22	4	MECH	PSA-35	81	*FAC 311'*	X	SLI							X				
MSU-25	4	MECH	PSA-100	81	*FAC 311'*		X									X		
MSU-26B	4	MECH	PSA-35	81	*FAC 311'*		SLT						X					
MSU-26T	4	MECH	PSA-35	81	*FAC 311'*		SLI						X					
MSU-27	4	MECH	PSA-35	81	*FAC 311'*		SLI	X								X		

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
MSU-29	4	MECH	PSA-100	81	*IB 298'*		X								X			
MSU-31	4	MECH	PSA-35	81	*IB 298'*	X								X				
MSU-32	4	MECH	PSA-100	81	*IB 298'*		X									X		
MSU-38	4	MECH	PSA-100	81	*IB 278'*	X								X				
MSU-39	4	MECH	PSA-100	81	*IB 298'*					X								X
MSU-40	4	MECH	PSA-100	81	*IB 298'*						X							
MSU-44	4	MECH	PSA-100	81	*IB 298'*							X						
RHU-30	4	MECH	PSA-35	03	*RB 238'*			X							X			
RHU-33	4	MECH	PSA-35	03	*RB 237'*			X							X			
DESIGNED TEST PLAN GROUP 5 – HYDRAULIC SNUBBERS (DTPG 5 POPULATION = 29)																		
AFU-109	5	HYDR	ANVIL-1.5	04	*IB 278'*						XO							
AFU-205	5	HYDR	ANVIL-1.5	04	*RB 277'*	X								XO				
AFU-208	5	HYDR	ANVIL-1.5	04	*RB 279'*		X									XO		
AFU-209	5	HYDR	ANVIL-1.5	04	*RB 289'*				XO									
AFU-224	5	HYDR	ANVIL-1.5	04	*RB 280'*			XO									X	
AFU-225	5	HYDR	ANVIL-1.5	04	*RB 285'*									XO				
AFU-226	5	HYDR	ANVIL-1.5	04	*RB 287'*					XO								

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
AFU-229	5	HYDR	ANVIL-1.5	04	*RB 289'*										XO			
FWU-3	5	HYDR	HSSA-10	84B	*RB 290'*	XO						XO						
FWU-5	5	HYDR	HSSA-10	84B	*RB 289'*	XO						XO						
FWU-21	5	HYDR	HSSA-20	84B	*TB 271'*	O	CA					XO						XO
FWU-44	5	HYDR	HSSA-30	84B	*IB 278'*			CA			XO							XO
MSU-8	5	HYDR	HSSA-20	84B	*RB 314'*	XO						XO						
N601	5	HYDR	GRINNELL-2.5	02	*RB 279'*			E		X								
N602	5	HYDR	GRINNELL-2.5	02	*RB 283'*			E								X		
N604	5	HYDR	GRINNELL-2.5	02	*RB 282'*		X	E										X
N605	5	HYDR	GRINNELL-2.5	02	*RB 282'*			X / E										
N607	5	HYDR	GRINNELL-2.5	02	*RB 282'*			E					X					
N608	5	HYDR	GRINNELL-2.5	02	*RB 279'*			E		X								
N615	5	HYDR	GRINNELL-2.5	02	*RB 282'*			E	X							X		
N616	5	HYDR	GRINNELL-2.5	02	*RB 283'*			E									X	
PS-2	5	HYDR	PMH-2103	02	*RB 284'*	#		E			X							
PS-4	5	HYDR	ANVIL 3306 SIZE 1	02	*RB 282'*		E							X				

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Snubber Program Testing Plan

TABLE 4.2 - SNUBBER PROGRAM TEST PLAN (5th Test Interval 2010 – 2019 and 6th Test Interval 2020 – 2029)

SNUBBER TAG	DTPG	TYPE	MODEL	PSSL	*LOCA-TION*	11	12	14	15	17	18	20	21	23	24	26	27	29
PS-5	5	HYDR	PMH-2103	02	*RB 279'*	#		E					X				X	
PS-6	5	HYDR	ANVIL 3306 SIZE 1	02	*RB 278'*		E	X										
PS-8	5	HYDR	PMH-2103	02	*RB 279'*			E							X			
PS-9	5	HYDR	ANVIL 3306 SIZE 1	02	*RB 280'*		E						X					
PS-10	5	HYDR	PMH-2103	02	*RB 282'*			E	X									
PS-11	5	HYDR	ANVIL 3306 SIZE 1	02	*RB 284'*		X / E								X			

TOTAL SNUBBER PROGRAM POPULATION = 151

Attachment 4

Snubber Program Testing Plan

Notes for Table 4.2:

1.) The R.E. Ginna Nuclear Power Plant began commercial service in 1970. The Ginna Station Snubber Program, historically covered by previous Ginna ISI Program Test Interval plans, now has been removed from the scope of the ISI Program Test Plan for the 5th Test Interval (2010 – 2019). The 5th Test Interval began in 2010, however Ginna did not have a RFO until 2011, and therefore the first Snubber Program testing evolution of the 5th Test Interval took place in 2011.

2.) From 2011 to 2015, all mechanical snubbers removed for testing, which have not been previously re-greased by this effort, shall be subject to either re-greasing or replacement with a re-greased spare. Beginning in 2014, a requirement is been added to the Service Life monitoring program, such that the entire initial 10% sample shall be re-greased or replaced with a re-greased spare. All snubbers shall be re-greased with NRRG-2.* Snubbers CVU-590 & CVU-591 were added to the snubber program in 2013 and initially tested for the program in 2014.

3.) This test plan shall be updated in accordance with Section 6.4.

4.) Nomenclature:

X – Part of an Initial Test Sample

– Part of an additional test lot

O – Seal replacement required

% – 100% of population exam year

XD – Found degraded the previous year

XF – Failed the previous year, retests for snubbers in locations which failed the previous inservice test are required per Section 5.1.E.8

M – Removed and tested in support of maintenance

E – Replaced with equivalent

S – Hand-stroked to verify operational readiness

SLI – Service life examination

SLT – Service life test

CA – Tested as Corrective Action (other than exam or test failure)

Attachment 5

Snubber Program Test Criteria and Testing Guidelines

TEST CRITERIA FOR GRINNELL, ANVIL & BERGEN-PATERSON SNUBBERS

1.0 Functional testing of Grinnell, Anvil or Bergen-Paterson snubbers shall consist of the following:

1.1 Activation Test (Locking Velocity)

1.2 Load Capability Test

1.3 Release (Bleed) Rate Test

2.0 The test machine and procedures to be used for snubber testing shall be reviewed and accepted by Engineering prior to use. The Grinnell Model 5434-3 test machine is approved for use.

3.0 Locking velocity shall be determined by mounting the snubber in the test frame and gradually increasing the velocity of the power cylinder piston until the snubber activates (locks up). This test shall be performed for both tension and compression loading of the snubber.

3.1 For snubbers removed from service for the expressed purpose of functional testing, the snubber is ACCEPTABLE if the locking velocity is from 3 to 20 inches per minute.

3.2 Snubbers that have provisions for field adjustment of locking velocity shall, if necessary, be adjusted so that its locking velocity falls within the specified range for that type of snubber in Table 5.1. This adjustment shall be made prior to returning the snubber to stock or service.

4.0 The snubber load capability shall be verified by increasing the snubber rod velocity until the snubber locks. The measured load at locking velocity shall be no less than the normal load capacity from Table 5.1 for both tension and compression loading and no more than 10% over the normal load capacity.

5.0 The snubber bleed rate shall be verified by monitoring the snubber rod velocity immediately after the snubber lockup. This test shall be performed for both tension and compression loading of the snubber.

5.1 Those snubbers removed from service for functional testing are ACCEPTABLE if their bleed rate is from 2 to 20 inches per minute.

5.2 Snubbers that have provisions for field adjustment of bleed rate shall, if necessary, be adjusted so that its bleed rate falls within the specified range for that type of snubber. This adjustment shall be made prior to returning the snubber to stock or service.

6.0 Any visible evidence of leakage from the snubber during the testing shall automatically negate the results of that test. The leakage shall be evaluated by Engineering for cause and if the leakage is a result of the set up for the testing, the leakage shall be corrected and the test repeated.

7.0 UNACCEPTABLE snubber functional test results shall be reviewed and reported in accordance with the requirements of CNG-CA-1.01-1000.

Attachment 5

Snubber Program Test Criteria and Testing Guidelines

TEST CRITERIA FOR PAUL-MUNROE SNUBBERS

1.0 Functional testing of Paul-Munroe snubbers shall consist of the following:

1.1 Release (Bleed) Rate Test

1.2 Load Capability Test

1.3 The test machine and procedures to be used for snubber testing shall be reviewed and accepted by Engineering prior to use. The Grinnell Model 5434-3 test machine has been approved for use.

2.0 Bleed rate testing shall be performed concurrent with the load capability test. These tests shall be achieved by increasing the snubber rod velocity until the snubber resisting load is equal to its normal load rating. The ACCEPTABLE bleed rate velocity is from 2 to 20 inches per minute.

3.0 The snubber load capability shall be verified by increasing the snubber rod velocity until the snubber locks. The measured load at locking velocity shall be no less than the normal load capacity from Table 5.1 for both tension and compression loading and no more than 10% over the normal load capacity.

4.0 Any visible evidence of leakage from the snubber during the testing shall automatically negate the results of that test. The leakage shall be evaluated by Engineering for cause and if the leakage is a result of the set up for the testing, the leakage shall be corrected and the test repeated.

5.0 UNACCEPTABLE snubber functional test results shall be reviewed and reported in accordance with the requirements of CNG-CA-1.01-1000.

6.0 Hydraulic piping snubber acceptance criteria are available Table 5.1.

Attachment 5

Snubber Program Test Criteria and Testing Guidelines

TEST CRITERIA FOR ANKER-HOLTH SNUBBERS

1.0 Functional testing of Anker-Holth snubbers shall consist of the following:

1.1 Release (Bleed) Rate Test (without lockup)

2.0 The test machine and procedures to be used for snubber testing shall be reviewed and accepted by Engineering prior to use. The Anker Holth Hydraulic Suppressor Test Stand has been approved for use.

3.0 The snubber bleed rate shall be verified by monitoring the snubber rod velocity. This test shall be performed for both tension and compression loading of the snubber.

3.1 Those snubbers removed from service for functional testing are ACCEPTABLE if their bleed rate meets the following criteria:

- Piston movement @ 800 psig for 5 minutes:
  - Minimum Travel 0.0535" (0.0107 IPM)
  - Maximum Travel 0.1000" (0.0200 IPM)
- Piston movement @ 1200 psig for 5 minutes:
  - Minimum Travel 0.0770 (0.0154 IPM)
  - Maximum Travel 0.1410 (0.0282 IPM)

4.0 If the snubbers do not meet the above criteria, they are UNACCEPTABLE and Engineering shall evaluate the condition for impact to the systems and components.

5.0 The snubber surface temperature and area ambient temperature shall be measured and recorded prior to each functional test.

6.0 The snubber temperature shall be allowed to stabilize in the test area for a minimum of 12 hours prior to testing. The snubber surface temperature shall be a minimum of 58°F.

7.0 Any visible evidence of leakage from the snubber during the testing shall automatically negate the results of that test. The leakage shall be evaluated by Engineering for cause and if the leakage is a result of the set up for the testing, the leakage shall be corrected and the test repeated.

8.0 UNACCEPTABLE snubber functional test results shall be reviewed and reported in accordance with the requirements of CNG-CA-1.01-1000.

Attachment 5

Snubber Program Test Criteria and Testing Guidelines

TEST CRITERIA FOR MECHANICAL SNUBBERS

1.0 Functional testing of Pacific Scientific snubbers shall consist of the following:

1.1 Break-away and drag force test (Friction test)

1.2 Activation and release rate test (Acceleration test)

2.0 The test machine and procedures to be used for snubber testing shall be reviewed and accepted by Engineering prior to use. The Pacific Scientific VALIDATOR test machines have been approved for use.

3.0 For mechanical snubbers, the testing load has no impact on the drag force and for the activation test changes in applied load have shown relatively insignificant impact on the results of the test. Testing shall be conducted at 100% of rated load with a tolerance of $^{+0\%}_{-10\%}$ to ensure that the snubber is not overloaded during the testing process.

4.0 The friction test shall be conducted prior to the acceleration test and again after completion of the acceleration test to verify no damage occurred during the testing.

4.1 The friction test shall record the maximum force required to initiate and maintain motion over approximately eighty percent of the total snubber travel in both directions. The maximum drag force shall be used for classification of the snubber as ACCEPTABLE, DEGRADED, OR UNACCEPTABLE. In addition, average drag force should be recorded for trending and service life monitoring purposes.

4.2 For tests performed using the Pacific Scientific VALIDATOR snubber tester, Table 5.3 may be used to determine the torque equivalent to snubber friction force percentage.

4.3 The measured friction force shall be considered ACCEPTABLE for any snubber installed in any location if the force is not greater than 2% of the snubber normal design load.

4.4 If the snubber friction force is greater than 2% but less than 5%, the snubbers acceptability shall be determined based on its installed location using Table 5.4.

4.5 A snubber with a friction force greater than 2% but less than 5%, found to be not in accordance with the values shown on Table 5.4 may be determined to be acceptable based on an Engineering review of the specific installation.

4.6 Any snubber with a friction force greater than 5% of its normal design load is UNACCEPTABLE.

4.7 Any snubber with a friction force greater than 2% shall be considered to be DEGRADED and shall be repaired or replaced as a preventative maintenance measure.

4.8 No snubber shall be installed with a pre-service friction force greater than 1%.

5.0 The acceleration value at which the snubber actuates (and also releases) shall be tested in both compression and tension.

5.1 The snubber is ACCEPTABLE if the acceleration level is no greater than 0.02 g. Any snubber with an acceleration level greater than 0.02 g is UNACCEPTABLE.

6.0 Following completion of the acceleration test, the snubber shall have a final friction test. If additional testing is performed after this final friction test, the final friction test shall be repeated to verify that no damage occurred as a result of the testing.

7.0 UNACCEPTABLE snubber functional test results shall be reviewed and reported in accordance with the requirements of CNG-CA-1.01-1000.

TABLE 5.1 – HYDRAULIC SNUBBER TEST ACCEPTANCE CRITERIA TABLE

Snubber Description	Bore/Size	Rated Load Capacity (lb.)	Locking Velocity (in./min.)		Release (Bleed) Rate (in./min.)	
			Operable	Calibrated	Operable	Calibrated
Grinnell/Anvil 200N/201N (5" stroke)	1 ½"	3,000	3 to 20	8 ± 2	2 to 20	4 ± 1
	2 ½"	2,500	3 to 20	8 ± 2	2 to 20	4 ± 1
	3 ¼"	21,000	3 to 20	8 ± 2	2 to 20	4 ± 1
Anvil 3306/3307	¼	350	3 to 20	8 ± 2	2 to 20	4 ± 1
	½	650	3 to 20	8 ± 2	2 to 20	4 ± 1
	1	1,500	3 to 20	8 ± 2	2 to 20	4 ± 1
	3	6,000	3 to 20	8 ± 2	2 to 20	4 ± 1
	10	15,000	3 to 20	8 ± 2	2 to 20	4 ± 1
	35	50,000	3 to 20	8 ± 2	2 to 20	4 ± 1
Bergen Patterson (EWR 1484)	1 ½"	3,000	3 to 20	N/A	2 to 20	N/A
	2 ½"	10,000	3 to 20	N/A	2 to 20	N/A
	3 ¼"	20,000	3 to 20	N/A	2 to 20	N/A
	4"	30,000	3 to 20	N/A	2 to 20	N/A
Paul-Munroe	2103	3,000	N/A	N/A	2 to 20	N/A

TABLE 5.2 – DRAG FORCE CONVERSION

Normal Load Capacity (lb.)	Drag Force (lbs.)				
	1%	2%	3%	4%	5%
350	3.5	7.0	10.5	14.0	17.5
650	6.5	13.0	19.5	26.0	32.5
1,500	15.0	30.0	45.0	60.0	75.0
3,000	30.0	60.0	90.0	120.0	150.0
6,000	60.0	120.0	180.0	240.0	300.0
10,000	100.0	200.0	300.0	400.0	500.0
12,500	125.0	250.00	375.0	500.0	625.0
15,000	150.0	300.0	450.0	600.0	750.0
20,000	200.0	400.0	600.0	800.0	1000.0
30,000	300.0	600.0	900.0	1200.0	1500.0
50,000	500.0	1000.0	1500.0	2000.0	2500.0
120,000	1200.0	2400.0	3600.0	4800.0	6000.0

TABLE 5.3 – PACIFIC SCIENTIFIC VALIDATOR TORQUE TO DRAG FORCE CONVERSION

Snubber Model	Normal Load Capacity (lb.)	Drag Force (in.*lbs.)				
		1%	2%	3%	4%	5%
PSA - 1/4	350	6.2	9.0	13.0	17.0	21.5
PSA – 1/2	650	8.0	16.0	24.0	32.0	40.0
PSA – 1	1,500	19.0	38.0	57.0	76.0	95.0
PSA – 3	6,000	105.0	210.0	315.0	420.0	525.0
PSA – 10	15,000	300.0	600.0	900.0	1200.0	1500.0
PSA – 35	50,000	336.0	672.0	1008.0	1344.0	1680.0
PSA – 100	120,000	1560.0	3120.0	4680.0	6240.0	7800.0

Reference: PS 247, Pacific Scientific VALIDATOR Instruction Manual

TABLE 5.4 – MAXIMUM ACCEPTABLE DRAG FORCE ON PIPING SYSTEMS
Reference: Westinghouse Snubber Drag Force Analysis, PT-PAE-1927

NORMAL LOAD CAPACITY (lbs.)	NOMINAL PIPE SIZE									
	1"	2"	3"	4"	6"	8"	10"	12"	16"	24"
Schedule 40 Pipe										
350	7.0	17.5*	17.5*	17.5*	17.5*					
650	6.5	19.5*	32.5*	32.5*	32.5*					
1,500		15.0	45.0*	75.0*	75.0*	75.0*	75.0*			
3,000			30.0	60.0*	150.0*	150.0*	150.0*	150.0*		
6,000			60.0	60.0	180.0*	300.0*	300.0*	300.0*		
10,000					100.0	200.0*	400.0*	500.0*	500.0*	500.0*
12,500					125.0	250.0*	375.0*	625.0*	625.0*	625.0*
15,000					150.0	300.0	450.0*	750.0*	750.0*	750.0*
20,000						200.0	400.0	600.0*	1000.0*	1000.0*
30,000							300.0	600.0	900.0*	1500.0*
50,000								500.0	1000.0	2500.0*
120,000										2400.0

TABLE 5.4 – MAXIMUM ACCEPTABLE DRAG FORCE ON PIPING SYSTEMS

Reference: Westinghouse Snubber Drag Force Analysis, PT-PAE-1927

NORMAL LOAD CAPACITY (lbs.)	NOMINAL PIPE SIZE									
	1"	2"	3"	4"	6"	8"	10"	12"	16"	24"
Schedule 80 Pipe										
350	7.0	17.5*	17.5*	17.5*	17.5*					
650	6.5	19.5*	32.5*	32.5*	32.5*					
1,500		15.0	45.0*	75.0*	75.0*	75.0*	75.0*			
3,000			60.0	90.0*	150.0*	150.0*	150.0*	150.0*		
6,000			60.0	60.0	240.0*	300.0*	300.0*	300.0*	300.0*	
10,000				100.0	200.0	400.0*	500.0*	500.0*	500.0*	500.0*
12,500					125.0	375.0*	625.0*	625.0*	625.0*	625.0*
15,000					150.0	300.0	600.0*	750.0*	750.0*	750.0*
20,000					200.0	400.0	600.0*	600.0*	1000.0*	1000.0*
30,000						300.0	600.0	900.0*	1500.0*	1500.0*
50,000							500.0	1000.0	1500.0*	2500.0*
120,000									1200.0	4800.0*

TABLE 5.4 – MAXIMUM ACCEPTABLE DRAG FORCE ON PIPING SYSTEMS

Reference: Westinghouse Snubber Drag Force Analysis, PT-PAE-1927

NORMAL LOAD CAPACITY (lbs.)	NOMINAL PIPE SIZE									
	1"	2"	3"	4"	6"	8"	10"	12"	16"	24"
Schedule 160 Pipe										
350	10.5*	17.5*	17.5*	17.5*	17.5*					
650	6.5	32.5*	32.5*	32.5*	32.5*					
1,500		30.0	75.0*	75.0*	75.0*	75.0*	75.0*			
3,000		30.0	60.0	120.0*	150.0*	150.0*	150.0*	150.0*		
6,000			60.0	120.0	300.0*	300.0*	300.0*	300.0*		
10,000				100.0	300.0*	300.0*	300.0*	300.0*		
12,500				125.0	250.0	625.0*	625.0*	625.0*	625.0*	
15,000					300.0	750.0*	750.0*	750.0*	750.0*	750.0*
20,000					200.0	600.0	1000.0*	1000.0*	1000.0*	1000.0*
30,000					300.0	600.0	900.0*	1500.0*	1500.0*	1500.0*
50,000								2000.0	2500.0*	2500.0*
120,000										6000.0*

* The acceptable snubber drag force is greater than 2%, but less than or equal to 5% of the normal load capacity.

Attachment 6

Snubber Failure Evaluation Worksheet

1.0 Snubber Information

EIN: _____

Make/Model/Size: _____

Serial Number: _____

DTPG: _____

2.0 Type of Activity (Check One)

	Preservice Examination		Preservice Test
	Inservice Examination		Inservice Test
	Service Life Monitoring Examination		Service Life Monitoring Test

IF the activity is an examination failure, then COMPLETE Section 3.0. IF the activity is a test failure, then MARK Section 3.0 N/A AND COMPLETE Section 4.0.

3.0 Examination Failure

Work Order: _____

Condition Report: _____

Attach copies of applicable examination reports to this Worksheet.

3.1 Evaluation of Examination Failure

Identify unacceptable conditions and suspected cause of each:

_____

_____

_____

_____

_____

_____

Attachment 6

Snubber Failure Evaluation Worksheet

3.2 Examination Failure Corrective Actions

Unacceptable snubbers shall be adjusted, repaired, modified or replaced.

A Perform follow up testing to determine the operational readiness of unacceptable snubbers. Record WO test performed under below.

Work Order: _____

3.3 Evaluate Impact on Examination Interval

In accordance with Table ISTD-4252-1, describe the impact to the Snubber Program Examination Interval:

_____

_____

_____

IF snubber operational readiness test results from section 3.2.A are satisfactory, THEN MARK Section 4.0 N/A. IF the test results are unsatisfactory, THEN COMPLETE Section 4.0.

4.0 Test Failure

Work Order: _____

Condition Report: _____

Attach copies of applicable test reports to this Worksheet.

4.1 Type of Failure

	DESIGN OR MANUFACTURING: failures resulting from a potential defect in manufacturing or design
	APPLICATION INDUCED: failures resulting from environmental conditions or actual application
	MAINTENANCE, REPAIR OR INSTALLATION: failures resulting from damage during maintenance activities
	TRANSIENT DYNAMIC EVENT: failure due to an unanticipated transient dynamic event
	UNEXPLAINED: failure for which the cause has not or cannot been determined
	ISOLATED: failure for which the cause was isolated to the failed snubber

4.2 Identify FMG

Explain the extent of the failure analysis and specific causes identified:

Identify the snubbers in FMG (snubbers may be listed by DTPG, system or individually):

4.3 Identify Additional Scope

How many snubbers in the initial test sample for the DTPG of the failed snubber? _____

Determine quantity of snubbers required in the additional scope:

For each DTPG:

C = _____

n = _____

N = _____ $N \geq 0.1 * n + C(0.1 * {}^{n}/_{2})$

N = total number of snubbers tested that were selected from the DTPG

n = number of snubbers in the DTPG

C = total number of unacceptable snubbers found in the DTPG (excluding those counted for FMG tests)

For each FMG:

C_F = _____

n = _____

N_F = _____ $N_F \geq C_F(0.1 * {}^{n}/_{2})$

N_F = all snubbers selected and tested from the FMG after the FMG was established from the DTPG

C_F = total number of unacceptable snubbers in the FMG, plus those found in the DTPG and used to establish the FMG

n = number of snubbers in the DTPG

What is the minimum number of snubbers required for the additional scope resulting from this failure? _____

Attachment 6

Snubber Failure Evaluation Worksheet

List all individual snubbers included in the additional scope:

_____

_____

_____

4.4 Evaluation of Supported Structure, System or Component (SSC)

Does the failed condition of the snubber require an evaluation or analysis to determine the impact on the supported SSC? Yes / No

If yes, record the calculation number or attach the evaluation for the supported SSC to this worksheet _____

Is SSC operability challenged by the snubber failure? Explain:

_____

_____

_____

_____

_____

_____

List recommended Corrective Actions to restore operability, if applicable:

_____

_____

_____

_____

_____

_____

Attachment 6

Snubber Failure Evaluation Worksheet

4.5 Impact on Service Life

Should the Service Life of this snubber be re-evaluated? Yes / No

If yes, discuss the extent of condition below **AND** record the calculation number **OR** attach the evaluation for the supported SSC to this worksheet:

_____

_____

_____

_____

_____

5.0 Record Actions Taken or List Items Tracking Completion of Corrective Actions

_____

_____

_____

_____

_____

_____

Preparer (print/sign/date)

_____

Reviewer (print/sign/date)

_____

Approver (print/sign/date)

Please attach additional sheets as necessary.

Attachment 7

Letter From Enertech Regarding Paul Munroe Snubbers

ENERTECH

TO: Project File 560523 **FROM:** Ira J. Silverman, PE

SUBJECT: Quick Disconnect: Radiation Exposure **DATE:** 21 January 2008

Reference: Seltis #0341227234GGS
Inquiry: JCUSTI/S7908N
Item Ref: PA27678/ZE1452N-3-MP2 Quick Disconnect (QD) w/Z544N-4 Dust Cap (Whittaker Controls)

Discussions held with representatives of Whittaker Controls indicate that the elastomer material used for seals is EPR.

The snubbers are operating in the following radiation environment, as provided to Enertech by the customer on 10 January 2007.

First Set: 120°F and 60 mR/hr.
Second set 120°F and 15 mR/hr.

As written, mR indicates milli-rems. For gamma radiation, 1 rem = 1 Rad.

For the first set of snubbers, the total integrated dose (TID) over a 37 year period will be below 2×10^4 Rads = 0.02 MRads. For the second set, the TID over the same 37 years is below 5×10^3 Rads = 0.005 MRads.

EPR, as well as Buna-N (Nitrile) and Viton all have radiation thresholds above 10^6 Rads = 1 MRad. Therefore, the use of any of these elastomers in the Quick Disconnect will be acceptable in this particular application.

Enertech Engineering considers EPR seals to be acceptable for use in this application.

The service life of the QD with the EPR seals has been given as 10 years. Given the low radiation dose and the ambient temperature of 120°F, and that the seal is in a static application, Enertech Engineering will agree to an extended service life as follows:

(1) The QD fittings are inspected within the next 60 days and found to be leak-tight.
(2) The QD fittings shall be inspected for leakage at 2-year intervals. If found to be leak-tight, the service interval may be extended for another 2 years. If leakage is found, the QD shall be replaced.

Attachment 8

Snubber Program Refueling Outage Summary Template and Guidance

This template is intended as a guideline for a summary report for each RFO and may be altered, amended or substituted as necessary to ensure appropriate description of the Snubber Program RFO activities.

1.0 Refueling Outage Information

Year: _____

Snubber Program Owner: _____

Supporting Vendor Information: _____

_____

2.0 Snubber Visual Examination Summary

of Examinations: _____

# of Exam Failures: _____

Impact to Exam Interval: _____

_____

3.0 10% Sample Plan Testing Summary

of Tests in the Initial Sample: _____

# of Test Failures in the Initial Sample: _____

# of Tests in the Expanded Samples: _____

# of Test Failures in the Expanded Samples: _____

4.0 Summary of Service Life Monitoring (SLM) Activities

of SLM Exams: _____

# of Unsat SLM Exams: _____

# of SLM Tests: _____

# of Unsat SLM Tests: _____

# of SLM Re-grease/ Rebuilds: _____

5.0 List Condition Reports Initiated Related to the Snubber Program

CR #	DESCRIPTION

6.0 Summary of any Lessons Learned Related to the Snubber Program

Identify unacceptable conditions and suspected cause of each and unanticipated issues (safety, scheduling, planning, etc.) and resolution:

_____

_____

_____

_____

_____

Attachment 8

Snubber Program Refueling Outage Summary Template and Guidance

7.0 Template for RFO Snubber Activity Summary

10% Sample Plan – Initial Sample

Count	WO	EIN	DTPG	Make/Mode	As Found			Repair/ Replace	As Left Serial #	Impact to Service Life	Comments
					Serial #	VT Result	Test Result				
1											
2											

10% Sample Plan – Expanded Samples

Count	WO	EIN	DTPG	Make/Mode	As Found			Repair/ Replace	As Left Serial #	Impact to Service Life	Comments
					Serial #	VT Result	Test Result				
1											
2											

Additional Visual Examinations

Count	WO	EIN	Make/Model	Serial #	Result	SL Impact	Comment
1							
2							

Service Life Monitoring Testing and Maintenance

Count	WO	EIN	DTPG	Make/Mode	As Found			Repair/ Replace	As Left Serial #	Impact to Service Life	Comments
					Serial #	VT Result	Test Result				
1											
2											

Snubber Inventory Maintenance

Count	WO	Storage Location	Make/Mode	As Found		Repair/ Replace	As Left Serial #	Impact to Service Life	Comments
				Serial #	Condition				
1									
2									

Miscellaneous Activities (Corrective Actions, Supporting Maintenance, etc.)

Count	WO	EIN	DTPG	Make/Mode	As Found			Repair/ Replace	As Left Serial #	Impact to Service Life	Comments
					Serial #	VT Result	Test Result				
1											
2											

Attachment 8

Snubber Program Refueling Outage Summary Template and Guidance

8.0 Attachments

Please attach copies of applicable test and exam reports, condition reports, pictures, failure evaluations, etc.